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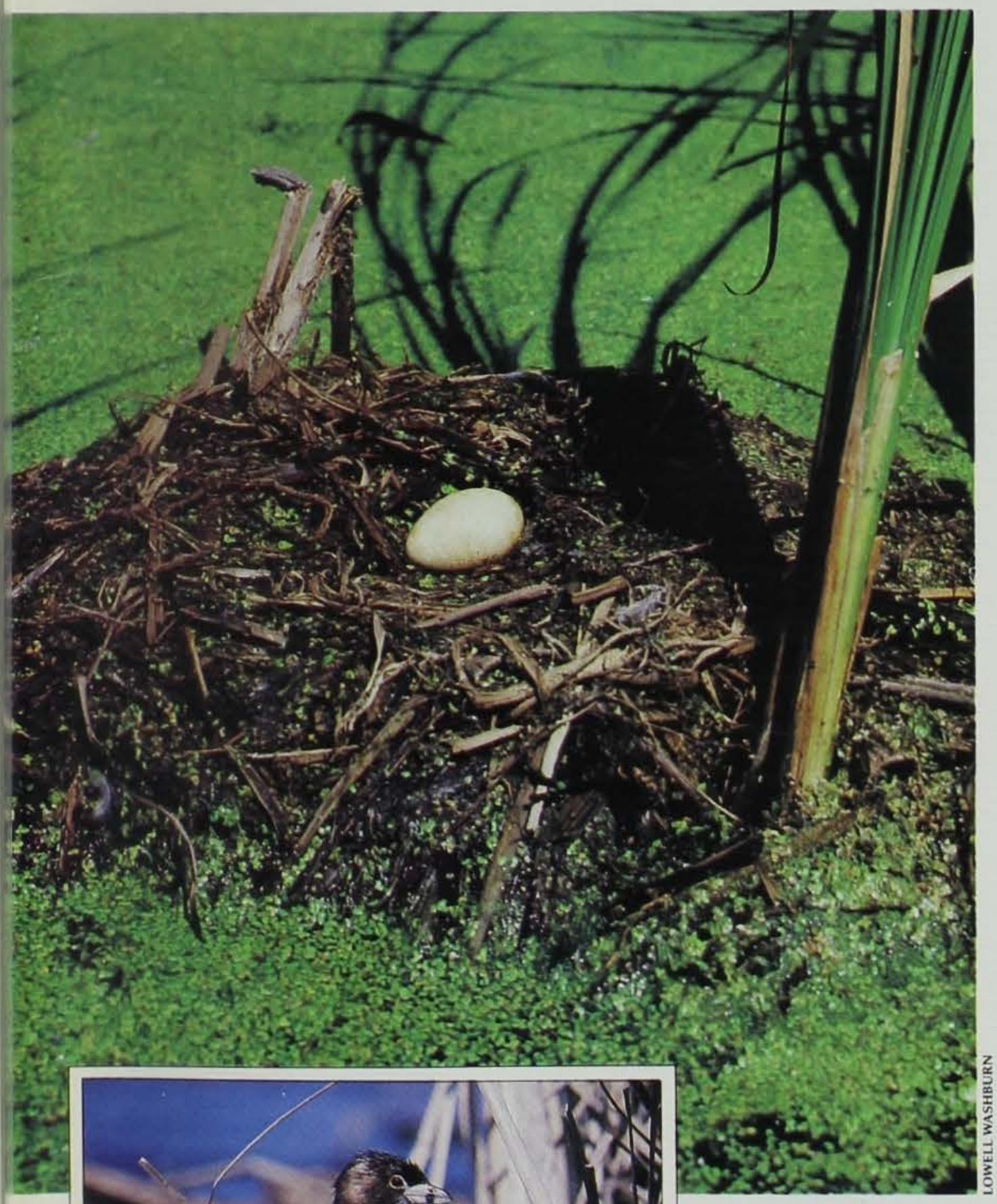
Front – Female killdeer and her well-camouflaged nest of eggs. Photo by Lowell Washburn. **Back** – The American Painted Lady, a common butterfly in Iowa, at Bellevue State Park's butterfly garden. Photo by Ron Johnson.

Avian Architecture

by Lowell Washburn



LOWELL WASHBURN

LOWELL WASHBURN

Pied-billed grebe and nest — a platform of rotting vegetation

MOST OF US CAN REMEMBER A FAVORITE CHILDHOOD PLAYground. One of mine was a grassy ridge that sloped down to a boggy marsh. One day, while deep in fantasyland on some imagined high adventure, I was jolted back to reality when a blue-winged teal exploded from between my feet.

Looking down, I saw the dozen or so eggs I had nearly stepped on. Getting down on hands and knees to examine the find, my nostrils detected the strong, "birdy" scent that I assumed must be the aroma that locks a running dog into a rigid point.

LOWELL WASHBURN

Blue-winged teal nest

The eggs were a dark, off-white color and were kept in place by the loosely woven grass walls and fluffy down chimney of the nest. I later learned that this dark down had been plucked by the hen from her own breast in order to allow the eggs to make direct contact with her skin. Whenever the hen left the nest to feed, the down was used to cover the eggs — providing both insulation and camouflage.

As I left the nest, I knew that the anxious hen was probably watching nearby. I returned to the spot sometime later, but was never able to relocate the duck or her eggs. Since that first encounter, I have had the opportunity to see many kinds of bird nests and am no less fascinated with them now than I was with that first chance meeting with the blue-winged teal.

DNR PHOTO

Mud pellet dome nests of cliff swallows.

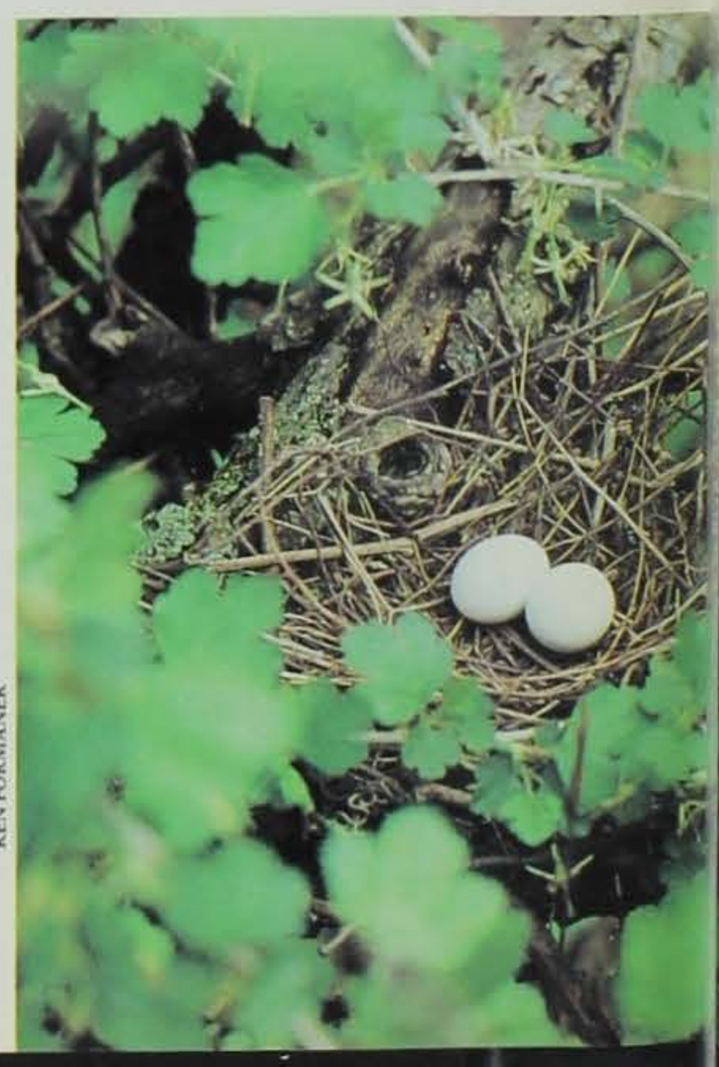
LOWELL WASHBURN

Mourning dove (above) and eggs (right) balance on the slop - pily made stick nest.

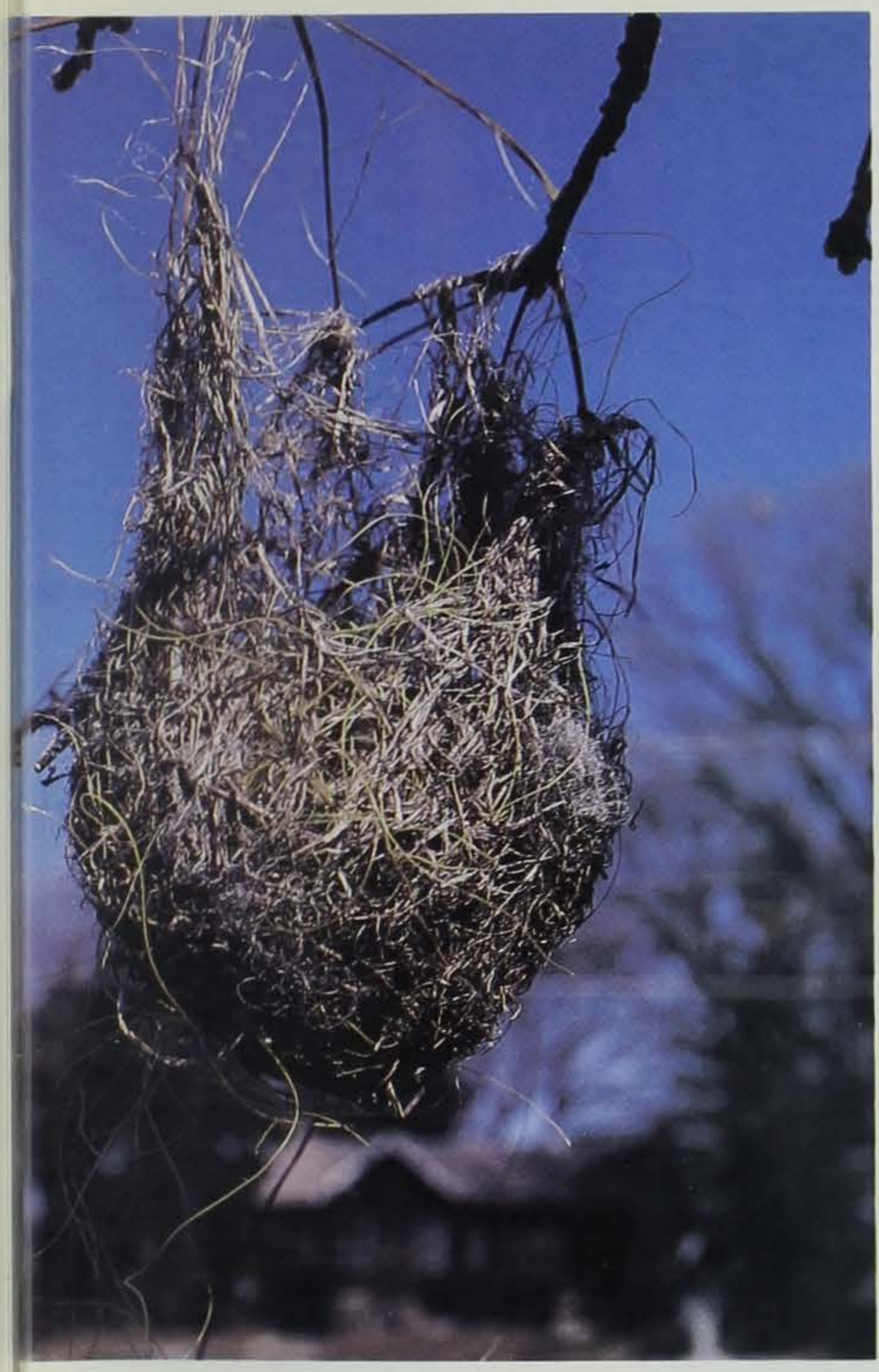
ALL TOLD, THERE ARE MORE THAN 180 SPECIES OF BIRDS THAT NEST IN IOWA. THE structures themselves are as unique and varied as the creatures that weave them, and range from the sloppily constructed twig platform of the mourning dove to the delicately woven and highly artistic hanging basket of the oriole. In order to complete their constructions, nesting birds use a wide variety of materials including mud, grasses, sticks, roots, feathers and bark. Some of the more bizarre items include lichens, horse hair, saliva and even spider silk.

Some nests, such as the durable mud and grass bowl of the robin, are quite obvious and frequently encountered by humans. Most, however, are well hidden and nearly impossible to detect.

But not all types of birds expend the effort needed to build elaborate nests. The great-horned owl, for example, uses those previously constructed by hawks or crows, while the killdeer simply scrapes out a shallow depression on bare, rocky soil. Other species, such as the timid American kestrel, seek the seclusion of natural tree cavities. Regardless of which form an individual nest may take, all lend a fascinating glimpse into a unique aspect of Iowa's natural history.



KEN FORMANEK



LOWELL WASHBURN

Northern oriole nest — an elaborate woven basket

Robin and young in their durable mud and grass bowl; Canada goose nest (bottom) atop a muskrat lodge — a nest on a nest.

LOWELL WASHBURN

LOWELL WASHBURN

Distilling the Truth About Ethanol

by Larry Dombrowski

Ethanol, also known as ethyl alcohol, is produced from fermented agricultural crops including corn, wheat, sugarcane, potatoes, beets and sorghum. The majority of ethanol produced in the U.S. is derived from corn.

ILLUSTRATION BY KAY IRELAN

ETHANOL HAS BEEN USED AS A FUEL SINCE THE INVENTION OF THE INTERNAL COMBUSTION engine. Ethanol-blended fuel, which consists of 10 percent ethanol and 90 percent gasoline, has been used by Iowans to travel more than 54 billion miles since the fuel was first introduced to the state in 1978. Despite its long history, ethanol remains one of the most controversial of all transportation fuels in terms of consumer acceptance, economics and energy security.

Even though the market share for ethanol blends in Iowa is more than 30 percent, there is a substantial number of Iowans who believe that ethanol blends are inferior to straight gasoline. The most common complaints include starting problems and engine pinging and knocking. In most cases, these problems can be attributed to the clogging of the fuel filter which may occur in older vehicles. Ethanol is a solvent, cleaning dirt and grime that normally accumulates in vehicles using straight gasoline. When these residues break loose, they are captured in the vehicle's fuel filter. Clogging of the filter prevents the normal flow of fuel from being supplied to the engine, thus problems with starting or engine pinging may occur. Once the dirty filter has been changed, the vehicle may actually experience improvement in performance due to a cleaner engine and fuel system.

The Colorado Department of Health recently completed a "blind" study on the performance characteristics of ethanol blends and gasoline. The study used data collected from approximately 2,500 vehicles covering 3.6 million miles. The vehicle model years ranged from 1960 to 1987. The drivers participating in the study did not know if an ethanol blend or straight gasoline was being used in their vehicles. The fuels were rotated so that each driver drove with both ethanol blends and gasoline in their tanks. Drivers were asked to rate driveability, cold starting, engine pinging and general driver satisfaction. Results of the study showed that no drivers reported any type of engine damage and 90 percent of the drivers rated ethanol blends and gasoline as equally "satisfactory."

Consumers are slowly beginning to view ethanol blends as a superior fuel. Ethanol has traditionally competed in the transportation fuels market as a gasoline extender. Ethanol is now being marketed for its value as an octane enhancer. By blending 10 percent ethanol with 90 percent gasoline, the octane rating of the fuel will be approximately three octane points higher than straight gasoline. With many automobile manufacturers producing high performance vehicles that recommend using higher octane mid-grade or premium gasoline, ethanol's demand as an octane booster is expanding.

Ethanol is also gaining support as a fuel which reduces air pollution. Ethanol use can help meet certain requirements of the Clean Air Act. The use of ethanol blends significantly reduces carbon monoxide emissions. Carbon monoxide is a colorless, odorless, tasteless and poisonous gas. More carbon monoxide is emitted into the atmosphere each year than any other pollutant. Currently, more than 70 urban areas in the U.S. fail to meet the Clean Air Act standards for carbon monoxide levels established by the Environmental Protection Agency (EPA).

Tests conducted by the EPA have shown that ethanol blends reduce carbon monoxide emissions in a vehicle by 10 to 30 percent, depending on the fuel combustion technology of the vehicle.

A growing number of state and local government agencies are considering the mandated use of fuels such as ethanol to meet EPA's standard for carbon monoxide levels. Tests conducted by the EPA have shown that ethanol blends reduce carbon monoxide emissions in a vehicle by 10 to 30 percent depending on the fuel combustion technology of the vehicle. The Front Range Area in Colorado, which includes Denver, has successfully mandated a program to limit emissions of carbon monoxide. Ethanol blends play a prominent role in Colorado's strategy to improve the environment.

The benefits achieved by reducing carbon monoxide levels with ethanol blends may be somewhat offset by increases in nitrogen oxide and hydrocarbon emissions. The reaction of nitrogen oxide and hydrocarbons in the presence of sunlight yields ozone. Use of ethanol blends tends to increase ozone concentrations which are also limited by the Clean Air Act. Ethanol increases the volatility, or the ease of which a liquid is converted into a gaseous state, of the base gasoline, potentially releasing gases into the atmosphere that increase ozone concentrations. Ozone, however, is a summer problem whereas carbon monoxide is a winter problem, allowing seasonal blending of ethanol to reduce carbon monoxide emissions without increasing ozone problems.

The ethanol fuel industry was created by a mix of federal and state subsidies, loan programs and incentives in response to our desire to become more energy secure after the "energy crisis" of the 1970s. However, ethanol production only accounts for less than one-tenth of one percent of U.S. energy needs. The production of ethanol will probably never supply the U.S. with a large portion of its energy, but ethanol production still has value as one component of a total alternative energy package to reduce our dependency on imported energy.

The ethanol industry has been able to grow and compete with gasoline because ethanol blends are exempt from six cents of the federal gasoline excise tax, and one cent of the state gasoline excise tax in Iowa. Since 10 gallons of an ethanol blend has one gallon of ethanol and nine gallons of gasoline, this translates into a direct subsidy of 70 cents for every gallon of ethanol sold in Iowa. The economic interplay of gasoline and ethanol prices is of paramount importance. For example, with today's wholesale

price of gasoline at 35 cents per gallon; ethanol will be a competitive product up to a price of $1.25 per gallon. Without tax exemptions for ethanol, crude oil prices would have to increase to at least $40 per barrel, with corn prices below $2 per bushel for ethanol producers to survive. Currently, a barrel of crude oil is selling for around $16.

...the 1985 price of corn was 10 cents per bushel higher than it would have been without domestic oil production. The production of ethanol increased the value of Iowa's 1986 corn crop by $160 million.

Federal and state gasoline tax exemptions for ethanol-blended fuel directly reduce highway trust fund revenues. For every gallon of ethanol sold in the U.S., federal highway funds decline by six cents. For every gallon of ethanol sold in Iowa, state highway funds decline by one cent. In 1987, 8.5 billion gallons of ethanol blends were sold in the U.S., reducing federal revenues by $510 million. State revenues were reduced by approximately $3.9 million as Iowans bought over 390 million gallons of ethanol-blended fuel.

Since ethanol production reduces both federal and state highway funds and has a limited role in energy security, why do many national and state policy makers continue to support the ethanol industry? As previously discussed, ethanol has positive social benefits by helping to reduce certain pollutants in urban areas. But ethanol production also has positive economic benefits. Ethanol production affects both the supply and demand for corn. The demand for corn increases because ethanol production creates additional markets for corn. Increases in demand lead to higher corn prices. According to a Purdue University study, the 1985 price of corn was 10 cents per bushel higher than it would have been without domestic ethanol production. The production of ethanol increased the value of Iowa's 1986 corn crop by $160 million.

Increases in ethanol production decrease federal farm program costs by raising corn prices. Expanded corn markets created by the ethanol industry can partially substitute for more traditional agricultural programs which have relied on price supports, supply controls and grain reserve programs to reduce excess domestic supplies.

The production of ethanol contributes directly to the Iowa economy. Iowa is the second largest ethanol producer in the U.S. The ethanol industry provides nearly 950 Iowans with jobs. Ethanol production is not labor intensive; however, a large plant will employ 50 to 150 workers. Additional indirect jobs, such as service jobs, will roughly equal the same number of plant workers. Wages paid to employees in the ethanol industry circulate within a community and encourage the expansion of other business. Also, because the ethanol industry uses corn as a feedstock, state agricultural income is enhanced.

Technical and public policy developments will continue to strengthen ethanol's role as a fuel in the future. The U.S. House of Representatives recently passed a bill which contains incentives designed to promote the production and use of vehicles that run on alternative fuels.

The main provision of the bill relaxes the federal government's Corporate Average Fuel Economy (CAFE) standards. The standards require that the average fuel efficiency of all the automobiles produced by a single automaker meet a certain level. The current standard is 26 miles per gallon. Cars designed to run primarily on methanol, ethanol or compressed natural gas would have CAFE ratings based on the amount of gasoline they use. This would mean that a vehicle getting 40 miles per gallon on an ethanol blend with a 15 percent gasoline content would get a CAFE rating of 133 miles per gallon.

Another provision of the bill requires that the federal government buy as many alternative fuel vehicles as possible. Federal agencies would be offered incentives to purchase these vehicles.

The bill would also require that the public be able to purchase alternative fuels at selected government facilities. This helps to eliminate the "chicken and egg" problem that has slowed the introduction of alternative fuel vehicles. Consumers are reluctant to buy alternative fuel vehicles because it's hard to find fuel for them. Service stations are reluctant to stock alternative fuels because there is little demand for those fuels.

New applications for ethanol fuels are promising. U.S. automakers are now beginning to produce flexible-fuel vehicles. Flexible-fuel vehicles are capable of running under any combination of ethanol or gasoline. These vehicles have an optical fuel sensor which determines the percentage of ethanol in the fuel and signals a control computer which automatically adjusts the fuel injection system and ignition timing to compensate for different blends of ethanol and gasoline without driver interaction. The flexible-fuel concept is valuable because it allows for the growth of ethanol-capable fleets without imposing unacceptable limits on usability or range of the vehicles when ethanol refueling facilities are not widely available. Thus, if a flexible fuel vehicle is traveling across the state, the driver can fill up the tank with ethanol in Waterloo and then refill the tank with gasoline in Ames without ever having to adjust or modify any part of the vehicle.

The production of ethanol may never reach the expectations bestowed upon the industry at its inception in the 1970s. However, ethanol will continue to be a part of the nation's energy picture as we strive to implement renewable domestic energy alternatives to replace unstable foreign supplies.

Larry Dombrowski is a research analyst for the department's energy bureau.

Some Revealing Facts About Fishing

by Don Bonneau

Fishing is the third most popular outdoor recreational activity in Iowa. This and a great deal of additional information was obtained from random interviews with folks throughout the state. These surveys indicated the popularity of fishing is overshadowed only by the popular pastime activities of picnicking and driving for pleasure.

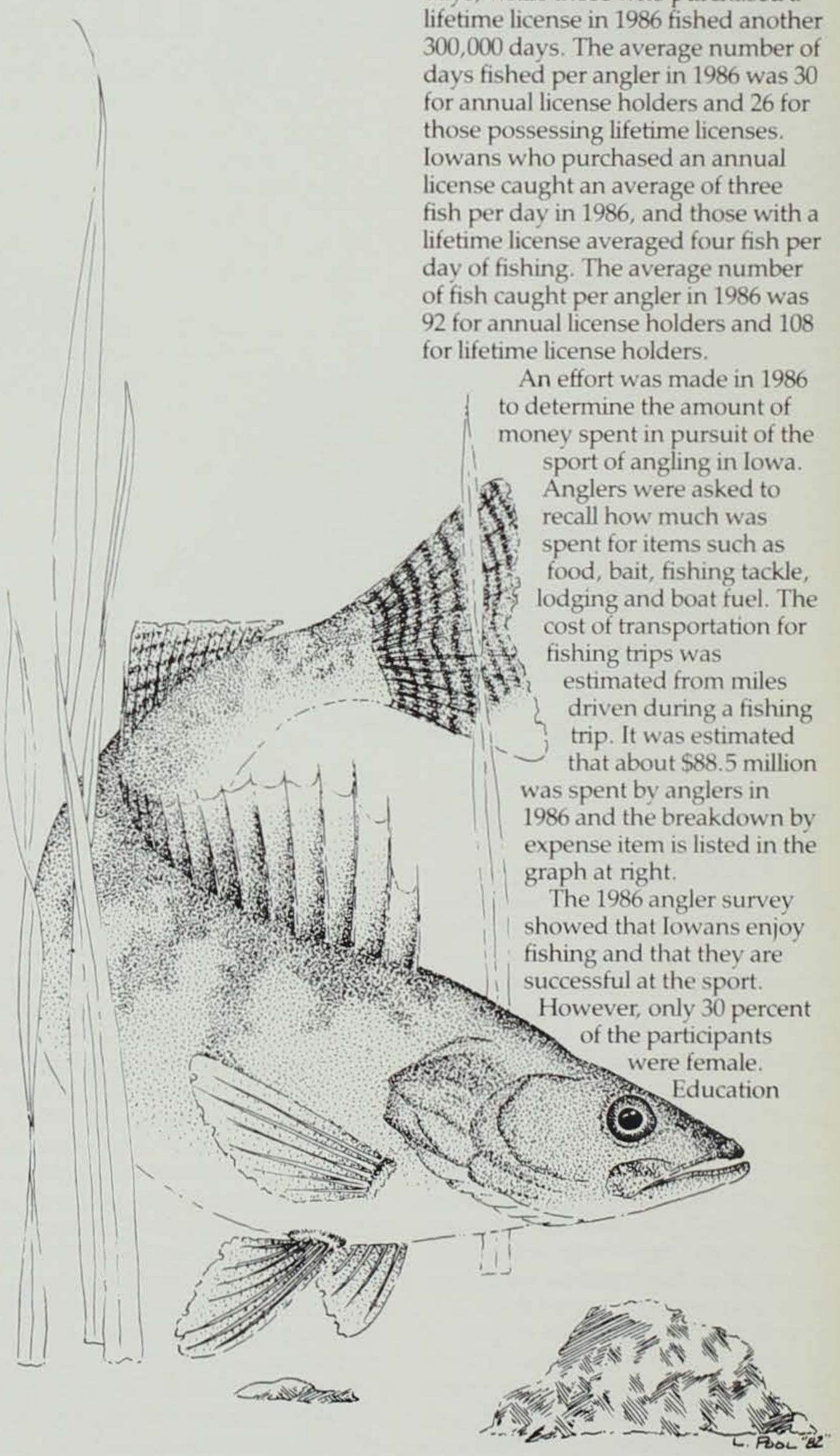
Yes, fishing is important to many Iowans and much of the popularity is due to the abundance of ponds, lakes and streams throughout Iowa. Iowa contains more than 19,000 miles of interior streams, 190,000 acres of the most unique stretch of the Mississippi River, 180 miles of the mighty Missouri River and 250 miles of picturesque trout streams. The state also has 35 natural glaciated lakes, 200 artificial fishing lakes, 87,000 farm ponds and four large flood control reservoirs. Is it any wonder that fishing is considered the most popular participant sport today and that its popularity is increasing?

Each year, Iowa's ponds, lakes and streams are fished by better equipped and more skilled anglers. These anglers are harvesting more fish than ever and they often have preferences as to the species caught and size of fish. Periodic surveys of large numbers of anglers provide valuable input into management programs developed by biologists for the state's many and diversified fisheries. This input from fishermen helps ensure that limited funds available are spent for the greatest benefit of those who participate.

One method used to obtain angler input into Iowa's fisheries programs is the "Survey of Iowa Anglers" which has been conducted at five-year intervals for the past 10 years. During the survey, approximately 3,000 licensed anglers are interviewed by telephone. Those interviewed are selected at random from the files of fishing licenses sold. The survey is conducted in late winter and early spring and anglers are questioned relative to their fishing experiences the previous year. The most recent survey was completed this past spring.

The graphs on the following pages summarize information obtained during the most recent survey in 1986 and helped characterize Iowa anglers and their fishing activity. During the period covered by the survey, 389,000 Iowans possessed resident fishing licenses. This figure did not include those anglers who possessed lifetime fishing licenses and those who reside in other states.

The survey estimates fishing by licensed anglers generates expenditures of $88.5 million per year. Therefore, a renewable and valuable resource is identified and the detailed information obtained from the angler is used to help improve the state's aquatic and associated recreational resources.



The total number of lifetime licenses in use is not available but 12,365 were sold in 1986 and there might well be more than 100,000 fishermen in this category.

Iowans who possessed 1986 licenses fished a total of 12 million days, while those who purchased a lifetime license in 1986 fished another 300,000 days. The average number of days fished per angler in 1986 was 30 for annual license holders and 26 for those possessing lifetime licenses. Iowans who purchased an annual license caught an average of three fish per day in 1986, and those with a lifetime license averaged four fish per day of fishing. The average number of fish caught per angler in 1986 was 92 for annual license holders and 108 for lifetime license holders.

An effort was made in 1986 to determine the amount of money spent in pursuit of the sport of angling in Iowa. Anglers were asked to recall how much was spent for items such as food, bait, fishing tackle, lodging and boat fuel. The cost of transportation for fishing trips was estimated from miles driven during a fishing trip. It was estimated that about $88.5 million was spent by anglers in 1986 and the breakdown by expense item is listed in the graph at right.

The 1986 angler survey showed that Iowans enjoy fishing and that they are successful at the sport. However, only 30 percent of the participants were female. Education

and training programs being planned today will introduce aquatic resources, their management and use to both sexes at a young age. Additional training being planned for junior and senior high students will be directed at making all participants more successful.

Walleyes are popular gamefish in Iowa but few are caught by most fishermen. In an effort to improve walleye angling, fisheries biologists are developing new management techniques. Research is leading to improved methods of production of fingerling walleye in hatcheries and more successful stocking strategies. This will increase the number of the highly prized walleye available to the angler and will undoubtedly mean a substantial increase in the number caught in the future.

Channel catfish are "king of gamefish" in Iowa. Management efforts for catfish are directed at improving stream accessibility through the acquisition of additional access to the most productive streams. Catfish are the most abundant gamefish in most streams, but research has found plants of large fingerling catfish in lakes are necessary and responsible for creating some fine lake catfishing. These lake fisheries are also the best producers of trophy cats — fish in excess of 10 pounds.

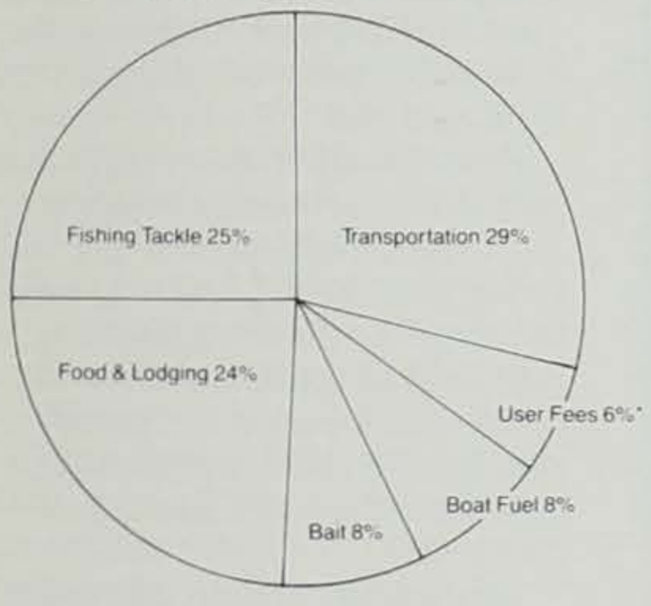
In 1986, 13 percent of all licensed angler trips were to farm ponds in private ownership, which amounted to a total of about 1.6 million trips. Each year the department spends about $3,000 to provide game fish for stocking new or renovated ponds. Last year about 150 ponds were stocked. An extensive cost/benefit analysis resulting from this survey and others shows Iowa anglers realize a high rate of return from this program. The estimated catch from these waters is nearly five million fish each year.

The survey estimated fishing by licensed anglers generates expenditures of $88.5 million per year. Therefore, a renewable and valuable resource is identified and the detailed information obtained from the angler is used to help improve the state's aquatic and associated recreational resources.

The examples listed are only a portion of the beneficial uses of the angler survey, but there is little doubt the information provided by anglers during this survey greatly impacts management of the fisheries resource. Participants in the surveys have been very cooperative and patient during the rather lengthy interviews and much of the success of the effort is due to angler interest in management and betterment of their sport. Thanks and good fishing.

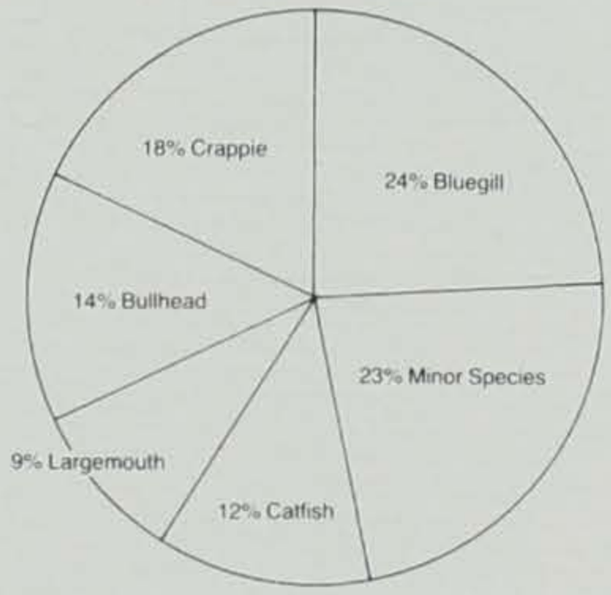
Don Bonneau is the supervisor of the department's fish research section.

BREAKDOWN OF THE $88.5 MILLION SPENT BY ANGLERS IN 1986.

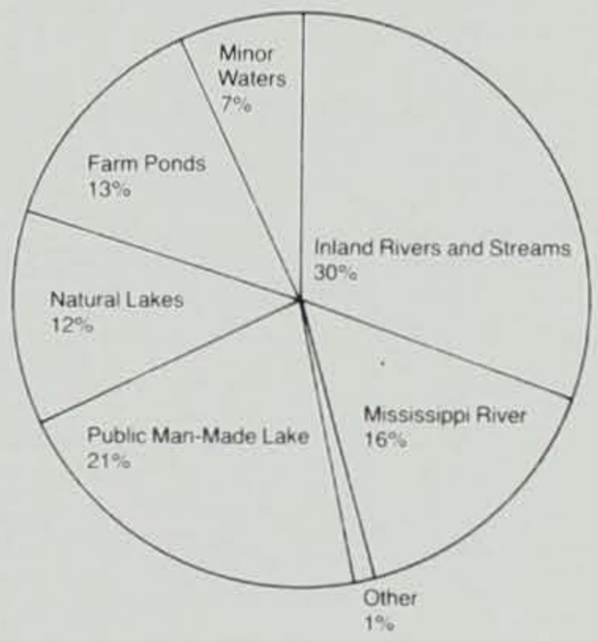


*User Fee Includes License Fees and Federal Excise Tax Paid on Fishing Equipment

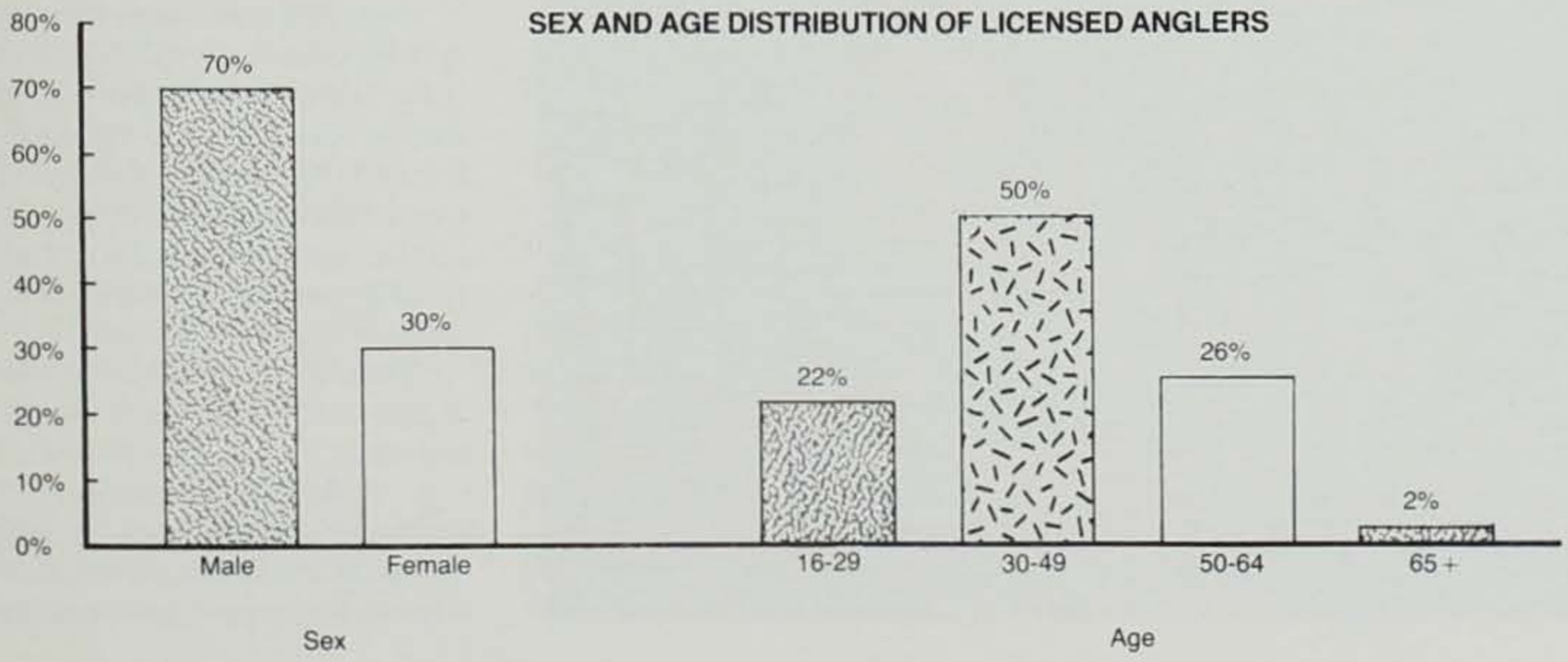
TYPE OF FISH CAUGHT



TYPE OF WATER FISHED

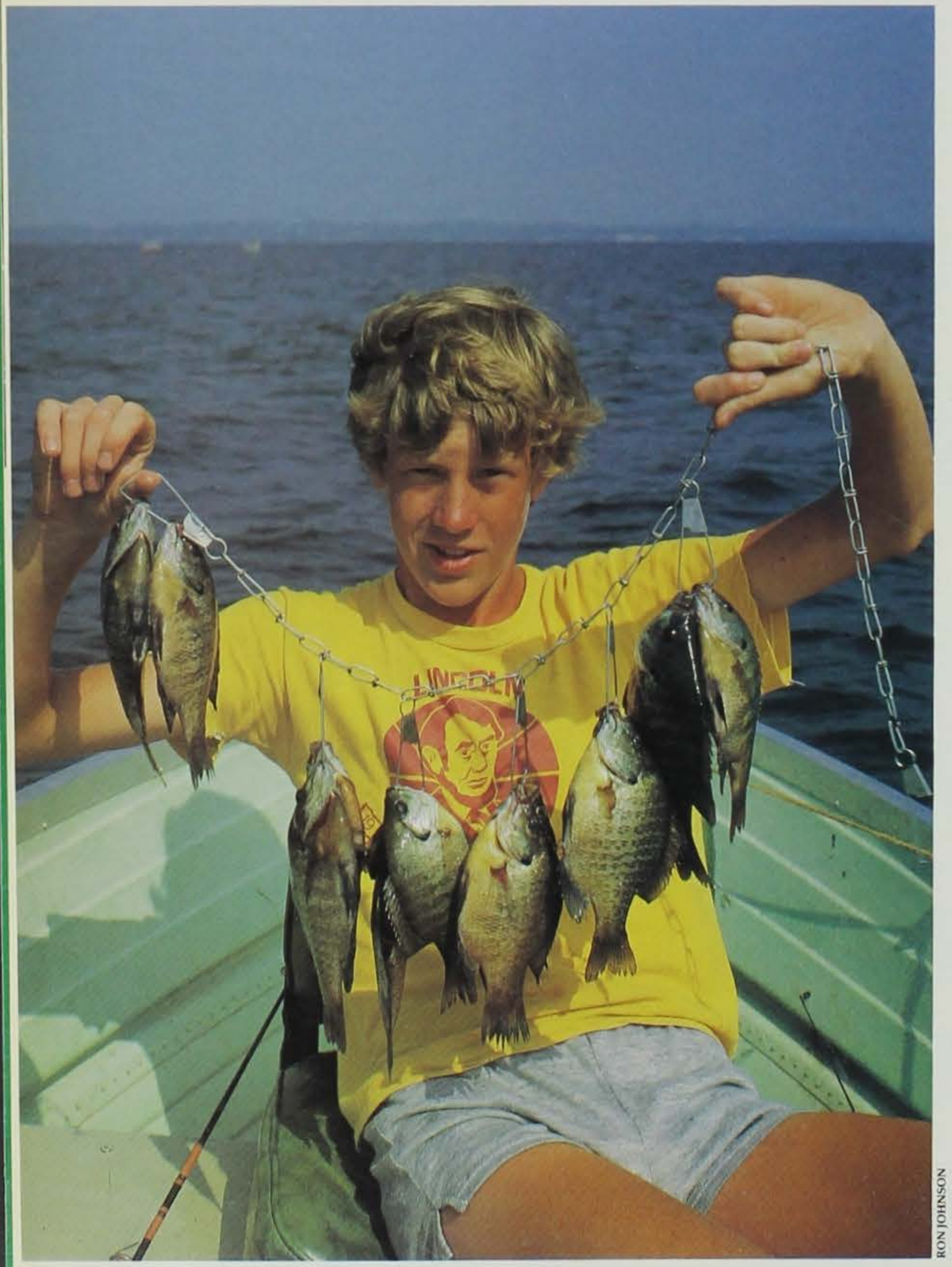


SEX AND AGE DISTRIBUTION OF LICENSED ANGLERS



Drop Everything! The "Blues" Are In

by Tom Putnam



RON JOHNSON

When I was a kid, I used to grab my flyrod, and with all the stealth of a 13-year-old, sneak around the cabin and "split" for Dad's canoe, beached 100 yards away. I could hear Mom calling, "You haven't finished your chores yet!" and I figured I'd be in trouble when I got back. The impending scolding would be worth it though, because I knew something most of the folks at Lake Macbride didn't. The male bluegills were on the nest! Chores seemed as if they would be there forever; nesting bluegills wouldn't.

Through the years, I have found my enthusiasm for fishing the bluegill and crappie spawn has not abated. After surviving the endless dreariness of January and February in Iowa, the thought of a fish basket loaded with tasty panfish is self-motivating. Where else can you procure a gourmet meal and have a ball doing it?

The secret to getting in on this action is timing. Properly coordinating your fishing efforts with the panfishes' biological clock can result in your catching them in the act. But if you are too late, you'll have to wait until next year.

A combination of environmental factors trigger the nest building response in both species. Two major factors are the photoperiod, that is the length of the daylight hours, and the water temperature. Once the proper photoperiod is attained, temperature becomes crucial and can determine the success or failure of the spawn.

Temperature is especially critical during the crappie spawn. Crappies begin spawning early in the spring when the water temperature is about 62 degrees Fahrenheit. During early spring, weather conditions have a habit of changing rapidly as cold fronts, driven by strong winds, move through the Midwest. Sudden temperature variations can force crappies off the nest and into deeper water. If this happens repeatedly, poor reproductive success may result.

When crappies do come into the shallows to spawn, it is the male that moves in first to set up "housekeeping." A nest site is selected in two to eight feet of water and can be only inches from the shoreline. It is usually near a piece of structure such as a

fallen tree, tree stump, roots or submerged brush.

The nest itself is nothing fancy. Usually no more than eight inches in diameter, the depression is created by fish fanning the sediment with its tail. In good habitat, there are often several nests near each other. Crappies prefer not to be overcrowded; a few feet separate most nests.

As male crappies occupy the nests, females congregate in deeper water close by. This is the time to present the deadliest of lures, the 15-cent crappie jig. Males can be taken near shore and females a bit deeper by casting from shore or a boat. When shore-fishing, hipboots become a valuable asset.

The smallest jig is the best. Favorite sizes range from 1/32 to 1/16 ounce. Jigs also come in a variety of designs including maribou, deer hair, mini-jigs with a split plastic tail and twister tails. Any of these will produce fish as long as they are presented in a small size.

A rainbow of jig colors are available with more variations offered with each year's new fishing catalogs. The key to color selection is to pay attention to water color or clarity. In clear water, most colors will work but yellow is a favorite. In more turbid water, use a jig with more visibility such as white or chartreuse.

Jigs can be presented either with or without a bobber depending on ones ability to maneuver the cast. Along steeper shorelines, a float may not be necessary. In shallower areas, where it is important to slowly retrieve at a constant depth, a bobber may be essential.

Some anglers still prefer using "crappie minnows" when fishing for this species. Think small when purchasing your minnows, and remember, one key to success is movement of your bait. Lure fishermen are often more successful during the spawn just because they are continually moving their lure.

Light lines are also the rule, especially in clear water. A few more lures may be lost to "tree bites" with four-pound test line, but many more strikes are the tradeoff.

My favorite panfish is still that scrappy bluegill. An eight-inch bluegill, taken on an ultralight rod with light line, can outfight a basketful of crappies. When I set the hook and the fish immediately races under the boat, doubling my rod in the process, I know I'm into a "lunker gill" and the fight is on.

Bluegill males begin their spawning activities a bit later than crappies, when the water temperature reaches about 68 degrees Fahrenheit. Building nests in shallow silt or sand flats, bluegills are more gregarious than their crappie cousins. A colony of 100 or more nests is not uncommon. Nests are in close proximity to each other, often only two to three feet apart. After males fan out their nests, which are shallow 10- to 15-inch depressions in the lakebed, they vigorously guard their mini-territories. A bait or lure passed across this domain is often struck at because it represents more of an intrusion than a food item.

Casting for bluegills on beds in the shallowest water can best be done using an ultralight rig, light line and a small bobber. As with crappie fishing, this allows a slow retrieve across the nest which will help increase the bluegill's "aggravation factor." With nests in water three feet or deeper, the float is not necessary.

Lures are similar in size to those used for crappies, but a 1/64- to 1/32-ounce jig is preferred. Since bluegills are primarily insect feeders, use colors imitating common aquatic insects and aquatic larval stages of terrestrial insects. The best colors are black and brown. Plastic and maribou both work with equal results.

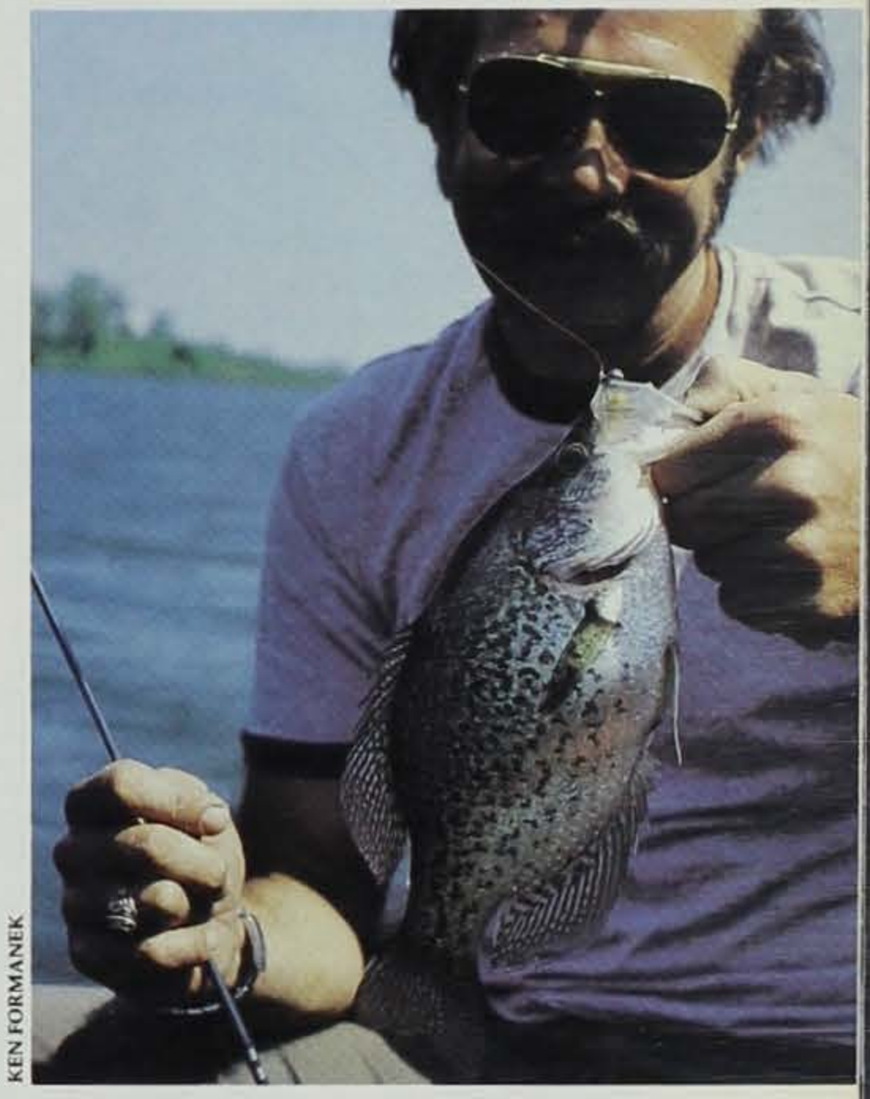
Not worried about getting your hands dirty? One of the best all-around baits is still the nightcrawler. Break off a short piece, about an inch long, impale it on a #8 long shank aberdeen hook, affix a float one and one-half feet up the line and prepare for some fast action.

Here are a few points to remember when panfishing during the spawn.

Don't be concerned about interfering with the panfishes' spawning cycle while catching them off the nest. Crappies and bluegills are extremely prolific and thinning them out during the spawn will help ensure better health in the surviving population.

Water temperatures can vary widely from lake to lake depending on its size, depth, watershed, groundwater contribution and location in the state. Farm ponds will be the first to show signs of spawning activity and may be as much as two to three weeks ahead of large, deep lakes. Searching out small areas farther south can also give you a head start on this spring's fishing.

Have you ever been frustrated because you can see fish on beds but can't get them to bite? Panfish can be very spooky while on the nest, especially in shallow, clear water. Try sneaking up on them, making sure to avoid any sudden movements of the shoreline vegetation during the stalk. Avoid bright-colored clothing and try casting a bit farther down the shoreline. Usually, if you can see the fish, they can also see you and are less apt to strike.



KEN FORMANEK

Finally, are those bluegills hitting short on your maribou jig? Remember that their mouths are small and they may not be able to suck in all those feathers. Try trimming off the back half of the maribou and the result will be more fish on.

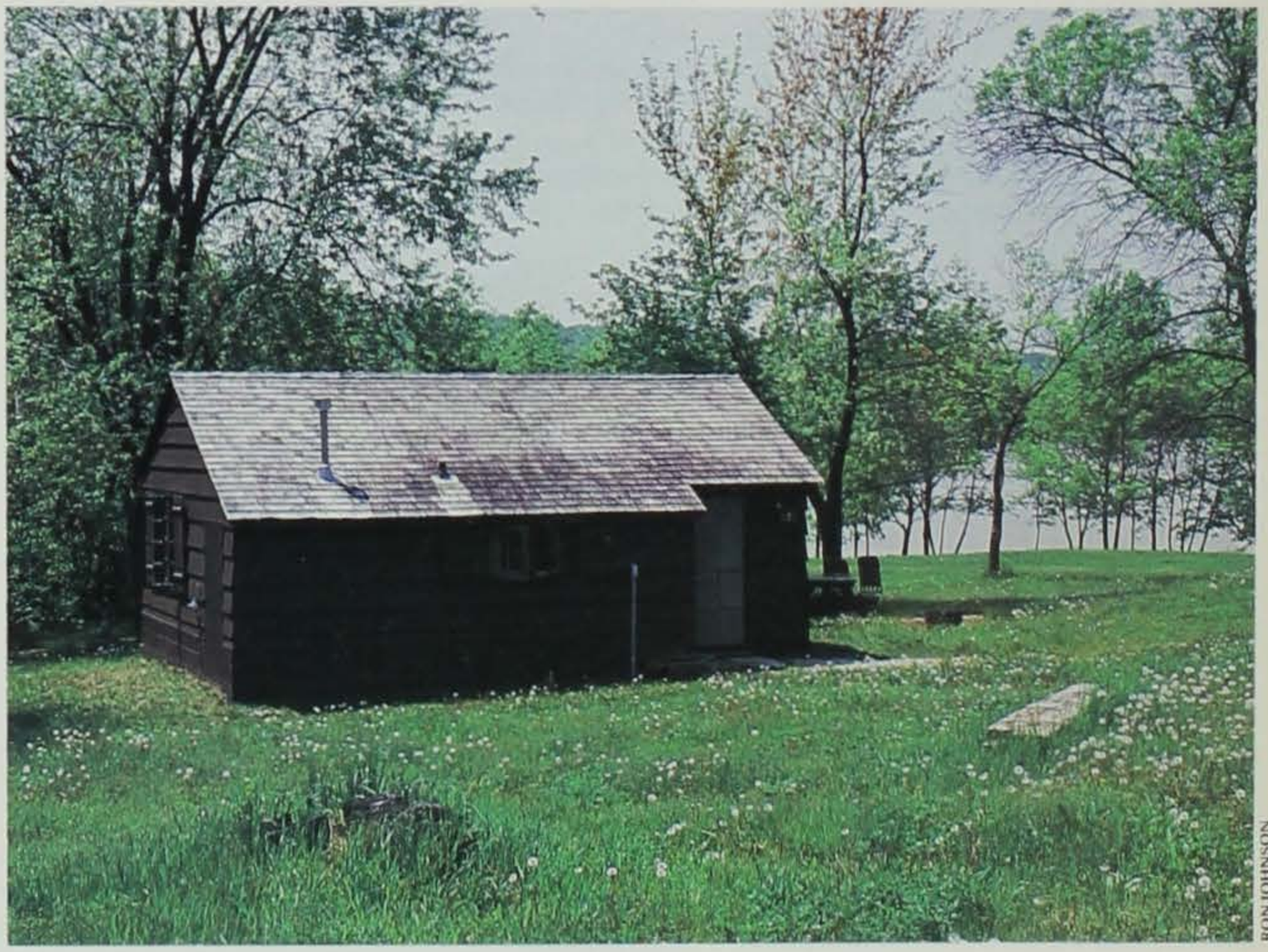
And also remember, a fish on is worth a scolding over abandoned chores any day!

Tom Putnam is a fisheries biologist located in Boone.

A GREAT ESCAPE

Lake Wapello's Cabins

by Jim Lawson



RON JOHNSON

IF A FAMILY VACATION IS IN YOUR FUTURE, BUT YOU'RE having a difficult time justifying the cost of a week's stay at your favorite out-of-state resort, why not consider spending your vacation closer to home. Lake Wapello's cabins could be the answer to an enjoyable and relatively inexpensive vacation for the entire family.

Lake Wapello, located just 30 miles southwest of Ottumwa, offers 14 modern cabins for rent during May through October. The cabins were originally constructed by the Civilian Conservation Corps in the 1930s. Even though some of the cabins have been reconstructed, seven of Wapello's 14 cabins are of the original vintage. Each cabin will accommodate four and comes equipped with all the comforts of home. Renters must provide their own bedding, towels and toiletry items. Other necessities such as dishes, cooking utensils, refrigerator, stove and shower are provided in each cabin. Although completely modernized, they have still retained their special warmth.

The cabins lie in a heavily wooded area overlooking the sparkling waters of Lake Wapello, a 289-acre artificial lake, which abounds with crappies, bluegills, bass and channel catfish. There is a supervised beach and a concession, complete with boat rental, snacks, pop, ice and bait — all within walking distance of the cabin area. Those who bring their own boats will appreciate the docks near the cabins for overnight boat mooring. There is also an enclosed shelter, available for rental, which is ideal for family gatherings. It is equipped with flush toilets, a cooking stove, refrigerator and a fireplace. For those of you that may have additional guests who enjoy camping, Lake Wapello offers a campground which will accommodate 88 camping units. Campers are also entitled to the use of a modern shower/rest room facility in the campground area.

If you are planning your vacation for the upcoming summer, you may make a cabin reservation in advance. All reservations must be made through the park ranger beginning January 1 or the first working day thereafter. Advance reservations are only accepted for a minimum of a one-week stay (Saturday to Saturday) and may be made by phone or mail. Upon receiving confirmation of your reservation, a deposit of $25 is required. Cabins may be rented for less than a week, with a two-night minimum, on a first-come, first-serve basis only. The cabins rent for $20 per night or $100 per week, which is very reasonable when compared to other forms of lodging.

Lake Wapello State Park might just provide one of the most economical and enjoyable vacations you have ever experienced. Its natural beauty, combined with its isolation, provides a very special atmosphere the entire family will enjoy. It's an ideal setting for picnicking, fishing, hiking, family reunions, or just a quiet weekend spent relaxing in the sun. Whatever your interests, Lake Wapello has something for everyone.

In addition to Lake Wapello, the following state parks also have cabins available for rent: Backbone, Lacey-Keosauqua, Lake of Three Fires, Palisades-Kepler, Springbrook, Dolliver and Wilson Island State Recreation Area. Information on any of these cabins may be obtained by contacting the park ranger.

Jim Lawson is the park ranger at Lake Wapello State Park.

The World of the Butterfly

by John Fleckenstein

Most of you know the monarch butterfly. If you raise cabbage or broccoli, you probably are familiar with the cabbage butterfly. Many of you have seen the pearly crescentspot and the mourning cloak, two of our most abundant butterflies. But did you know that 125 species of butterflies have been seen in Iowa? Some are as big and as brightly colored as the red-spotted purple and the monarch. About 50 species, called the skippers, are tiny, from one to two inches across, and mostly drab. Some species such as the common sulphur, are common everywhere in Iowa. Several, including the Dakota skipper, have been found only at one site.

No matter what their appearance or distribution, butterflies are a beautiful part of our natural heritage. They have economic value as pollinators, and they tell us something about the condition of our natural communities. For these reasons, we should help them survive in Iowa. Unfortunately, many species have declined drastically since modern agriculture came to Iowa. If they are to survive, we need to learn something more about them.

One of the most interesting aspects of Iowa butterflies is the manner in which they survive the winter. Some, like the monarch, fly up from the south every spring. Most however, remain here over the winter. They pass the winter in each of the four lift stages which all insects pass through.

Some, like Henry's elfin, spend the winter in a chrysalis. Some, such as the coral hairstreak, spend the winter as eggs. The Baltimore is one which spends the winter as a larvae. The red admiral and comma are two species which spend the winter as adults in a protected site such as a woodpile or hollow tree. Each life stage has advantages and disadvantages for survival through the winter, but together, they ensure the survival of most species.

The monarch is one of the few species which migrates south in the fall. It is not, however, the only species which cannot survive our winter. The black swallowtail, cloudless sulphur and little yellow are among those which appear in Iowa during the late spring or summer of most years. They produce a generation or two over the summer and do not migrate south in the fall. If we have a very mild winter, some may survive the winter, but most freeze out every year.

CATHY MEDDIN

Black swallowtail

Butterflies which over-winter as adults may live as long as nine months as adults. But as you might guess from their fragile appearance, most adults live only a short time. Some last as long as a month, but the average life of an adult is from

DNR PHOTO

DNR PHOTO

Pearly crescentspot (top) and Baltimore (above)

seven to 12 days. In spite of this short time, some species can be seen all summer. The cabbage butterfly may produce as many as five generations. Other species spread the emergence of a single generation over two or three months. On the other hand, some species are found as adults for only a week or two each year. Some of these species are among the rarest in the state.

About 40 species of butterflies have been recorded less than 10 times in Iowa since 1960. Records of these species are rare for almost every year and are frequently abundant. Other species, common in the south, are seen here very rarely. A gulf fritillary was seen in Ames this year. This is the second record known from the state. Iowa is not an important part of the range of these species, as they appear here only on rare occasions when conditions are right.

You have to be out at the right time of year to find many species. While most butterflies are active during the summer, a number of species fly in early spring or fall. Some of these species appear to be rare because few collectors are active at these times of year. Henry's elfin had been seen at three locations in Iowa before this year. The adults are active in April when redbud, the larval food plant, is in bloom. This April, I found Henry's elfin around redbud in three state parks in southern Iowa. I think we will find this species in many more locations as we survey at the correct time.

You have to survey the right habitat to find a butterfly. Until this year, we had seven records for the olive hairstreak. They are found around junipers, frequently in abandoned old pastures or overgrown prairies. This year, when we started looking in these areas for them, we found six new sites. While this species appeared to be rare, it is probably doing well in the state.

It is important to know how to identify what you catch. This past winter, we came close to figuring out how to identify the wild indigo duskywing. The wild indigo is one of four very similar looking species of duskywing. After going through collections from around the state, we discovered that we have eight sites for the wild indigo.

We try to spend most of our time surveying species which are rare in the state. We are especially interested in those which are rare across their entire range in the country. More than 99 percent of Iowa's prairie has been plowed, badly overgrazed or otherwise destroyed. The situation with wetlands is only somewhat better. Because of this, many of our prairie and wetland butterflies are now rare. Although several woodland butterflies are on our list of rare species, most of our work centers on prairie and wetland butterflies. Since prairies and wetlands have been badly disturbed across the country, we have populations of some of the rarest butterflies in the country.

JIM SCHEFFLER

About 70 species of butterflies are found on prairies. As many as 20 of these are found only on prairies which are in relatively good condition. The great-spangled fritillary and regal fritillary are two of the largest and most beautiful of the prairie butterflies. Far more common than these large butterflies are the small skippers. About 15 of the skippers are dependent on prairies. They have suffered more than any other group with the destruction of prairies.

The Dakota skipper is known from fewer than 25 sites in the country. Although most of the known sites are in North and South Dakota and Minnesota, it was first recorded near Grinnell in 1911. Since then, it has been collected near Sioux City and on Cayler Prairie in Dickinson County. Cayler Prairie is the only site still known in Iowa.

Adult Dakota skippers fly for two weeks in early July. Males perch on high points such as rocks or tall flowers. They fly out to investigate passing butterflies in search of mates.

ROBERT DANA

About 70 species of butterflies, including the great-spangled fritillary (left) and the Dakota skipper (above), are found on prairies. Because of the destruction of prairie habitat, their survival is uncertain.

Females lay eggs on grasses, often using little bluestem. After hatching, the larvae feed on grasses through early fall. They winter in a tunnel of silk built just below the ground. In spring, they resume feeding, form a chrysalis and eventually emerge as adults. (The 20 species of prairie skippers over-winter in different locations and emerge at different times, but are otherwise similar.)

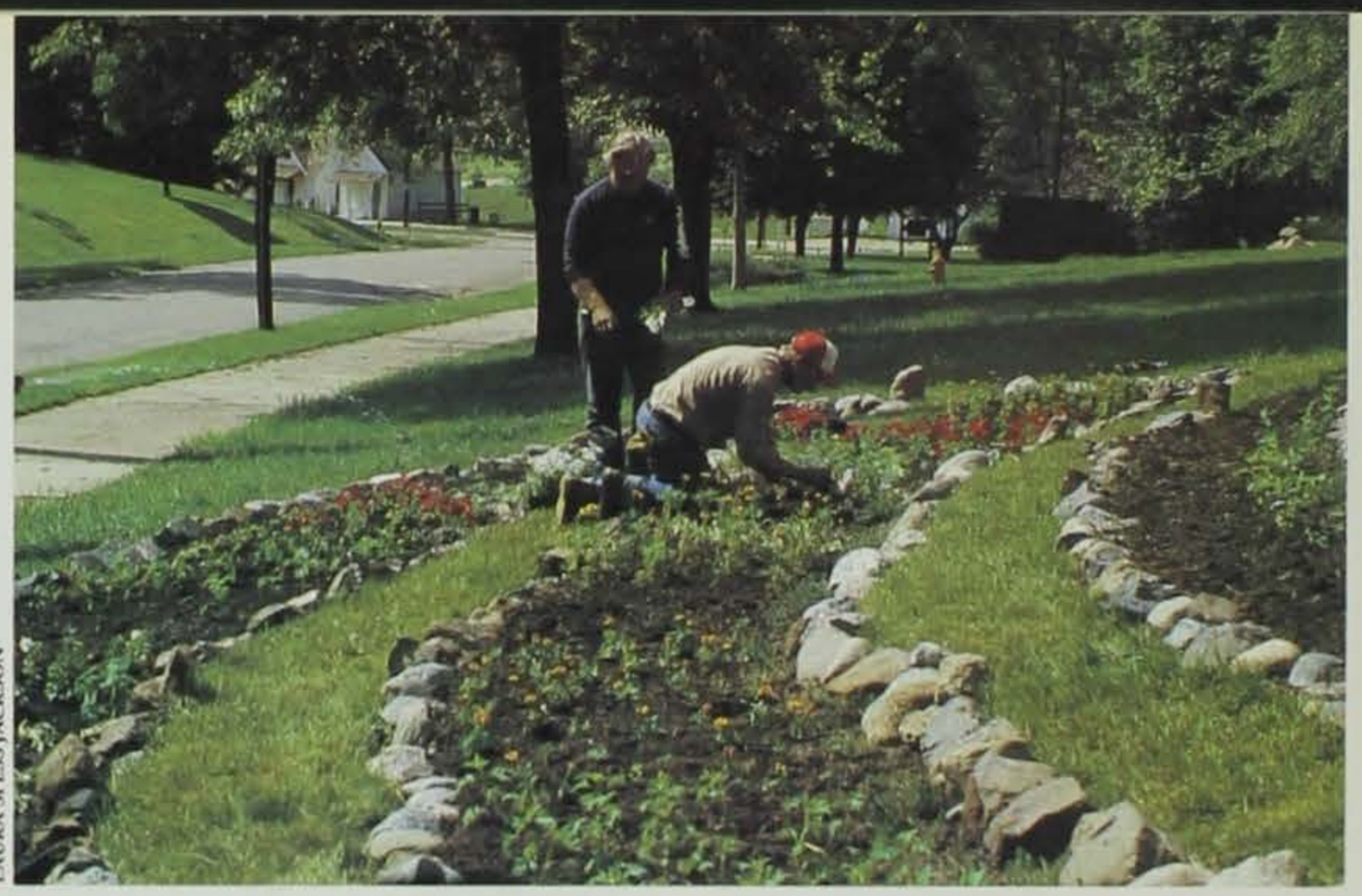
Dakota skippers are usually found on mixed grass prairies. Little bluestem, needlegrass and junegrass dominate these sites. Purple coneflower is often abundant and besides being a favorite nectar source, it is used as a perch by males. In Iowa, this vegetation type is found in the Loess Hills and at a few other sites in the northwest.

The Dakota skipper and other species which depend on prairies have suffered for several reasons. The main problem has been the loss of prairie habitat due to plowing. Overgrazing has destroyed populations where favorite food plants were grazed out. But even if an area is protected from these abuses, survival of butterfly species still is not guaranteed. Pesticides may drift in from adjacent fields, affecting the butterfly or its food plants. Management practices such as burning or mowing may be harmful if used incorrectly.

Some populations disappear regardless of our actions. Populations of most insect species, including butterflies, can vary widely from year to year. If conditions are good, they are able to increase numbers quickly. If conditions are bad, numbers may drop. A hard rain during the flight period may wipe out adults. A mild winter may allow more individuals to survive. If a population is wiped out, the site is open for recolonization. Some species such as the regal fritillary are excellent colonists, able to fly great distances. Other species including many of the skippers rarely fly more than 50 yards from where they hatch. These species are slow to recolonize sites. They may not return at all if the

LAURA SPESS JACKSON

Buckeye



LAURA SPESS JACKSON

Butterfly garden at the Iowa State Fairgrounds in Des Moines.

site is isolated. We have not studied the impact of these problems on Iowa's butterflies.

In the past two years, we have learned quite a bit about butterflies in Iowa. Several species have been found at many more locations than were previously known. We know more about the habitat requirements of several rare species. We still have many questions to answer. We do not know when many species are active or where they occur. Even the monarch has not been recorded in 11 counties! We need to study the habitat requirements of rare species. Some species are missing on sites which appear to be appropriate. We suspect that the size or an area may be important, but we do not know. We need to study current means of managing natural areas to see if they conflict with the maintenance of butterfly populations.

In the last few years, butterfly gardens have provided an excellent addition to studying butterflies in the wild. Gardens attract butterflies to areas where they can be seen by many people. They are great tools for education and also will help fill in the distribution maps of some species.

Our recent accomplishments are the work of a handful of people. We have a good background of knowledge on which to build, but there is much more to do.

John Fleckenstein is the data manager and zoologist for the preserves and ecological services bureau.

BACKYARD BUTTERFLIES

by Laura Spess Jackson

Gardening is one of the most popular hobbies in the United States. Although the word "gardening" normally conjures up images of fresh fruits and vegetables, you can also create a garden for butterflies.

Butterflies require two types of food — larval and adult. Larval foods are those plants which are eaten by the caterpillar. The caterpillar literally eats until it pops its skin. Then it merely waits, crawls out of its old exoskeleton, then eats until it has filled up the new skin and molts again.

As adults, butterflies require nectar for food. Nectar preferences range from flowers or tree sap to rotting fruit. Although butterflies may use a variety of plants, they still tend to show a preference for certain types of plants, plant shapes, colors and heights.

In addition to food, butterflies require sunny areas protected from the wind. Butterflies use sunlight to keep warm and navigate. Because of their lightness, it is easier for butterflies to fly in areas which are protected from the wind. Butterflies like to "sunbathe" on heat-radiating rocks or logs. Besides sunbathing many butterflies also like to "puddle." Butterflies are "puddling" when they gather along the edges of moist spots. Since butterflies cannot drink open water, these moist areas provide them with water and some salts and other trace nutrients they require.

Keeping these basics in mind, you can plan a butterfly garden as a home or school project. Butterfly gardening offers you an opportunity to watch the entire life cycle of an animal and combine knowledge gained from botany, entomology, soil science and gardening. It also offers some excellent viewing and photography opportunities. A butterfly garden can range in size from a whole backyard to a couple of plant clusters or a window box of plants.

To plan a butterfly garden, take a tour of your backyard and neighborhood. Locate a sunny area that you might use for your garden. If it is not already protected from the wind by a building, fence, hedge or hill, you can plan to add a hedge, trellis or other structure as windbreak. Southern exposures offer the longest amount of sunlight, and thus tend to have the most butterfly activity throughout the day.

If you have a natural depression or moist area, this may be a natural focal point for your garden. If not, you can create a mini-puddle with a sunken bucket of moist sand. If nothing else, note if there are nearby puddles in your driveway, gutter drainages, ditches, or a neighbor's yard. Stumps which hold water in their rotted core are also good puddling areas for butterflies.

Next, consider which species of butterflies you wish to attract. The butterflies which you will be most successful at attracting will be the types common in Iowa and are generalists in their food and habitat needs. A short food list for 14 of Iowa's more common butterflies is provided in the table below.

It will not take long to notice that many of the plants butterflies require for food, are not normally considered garden plants. However, to adequately plan your garden, it is necessary to realize the full plant potential of your area. Thus, the next step is a plant inventory to help you know what food and nectar sources are already available for butterflies in your neighborhood.

Now it's time to consider which plants to add to create your butterfly garden. In a very small area, you may want to just plant an herb garden, a window box of annuals or have a couple clusters of perennial and annual flowers. In a larger area you may want to plant a prairie plot, or design a more formal butterfly garden with native wildflowers, perennials and annuals. Remember that most native or older varieties of flowers tend to be most attractive to butterflies. Plants hybridized to have double blooms tend to have less nectar and are more difficult for butterflies to feed from because of the additional petals. If you are planting a larger garden, you'll also want to plan to have blooms from early spring through fall to offer butterflies a continuous source of food.

When designing where to put each plant, consider its height. To make the most of your viewing opportunities, put the shorter plants in front and taller ones in back. Also, put your plants in clusters. This makes them much easier to manage and identify, plus is more attractive to butterflies.

To manage your garden, trim some blossoms to generate continuous blooms. If you've planted larval food sources, don't be appalled if some of your plants show signs of being nibbled on — that's the whole point of having them. Avoid insecticide sprays since they can kill butterfly eggs, larva and pupa. Having a diversity of plants will normally prevent any "pest" outbreaks. During the fall and winter, rather than removing all of the dried flower stems, let them remain. This allows a safe winter refuge for any butterfly eggs, caterpillars or chrysalises. During the spring, after you trim the stems, let them lay for awhile to allow any larval forms a chance to escape once it becomes warm.

For the "wine connoisseurs" of the butterfly world, you can paint sugar, beer or salt solutions on logs or rocks, or set out sponges soaked in these solutions. You can also offer them fermenting fruits. Plans for a butterfly feeder, adapted from a design in Mathew Tekulsky's book, "The Butterfly Garden," is available by writing the Nongame Program, Department of Natural Resources, Wallace State Office Building, Des Moines, Iowa 50319-0034.

At the state fairgrounds a butterfly garden was started by the Department of Natural Resources' urban program in 1986. Since then more than 20 types of butterflies have been recorded. The premier butterfly garden in Iowa is at Bellevue State Park in Jackson County. The one-acre butterfly garden was created with over 100 species of plants. E.B. Lyons Nature Center near Dubuque also has a butterfly garden and many more are sprouting up across the state.

Additional information on butterflies and butterfly gardens is available from the following sources: "The Butterfly Garden," Mathew Tekulsky; "The Audubon Society Field Guide to North American Butterflies," Robert Pyle; "Butterfly Gardening and Conservation," Missouri Department of Conservation, Dave Tylka; "Butterflies and Moths of Missouri," Joan and Rich Heitzman.

Laura Spess Jackson is a nongame wildlife biologist stationed in Des Moines.

TABLE. Some food plants and nectar sources for 14 of Iowa's butterflies.

BUTTERFLIES	LARVAL	FOOD NECTAR
Eastern Black Swallowtail	Queen Anne's Lace, Carrot, Celery, Parsley, Dill	Milkweed, Thistle, Phlox, Clover, Alfalfa
Giant Swallowtail	Prickly Ash, Hoptree	Lantana, Milkweed, Lilac, Goldenrod, Dame's Rocket
Tiger Swallowtail	Cherry, Ash, Birch, Cottonwood, Willow, Lilac	Thistle, Milkweed, Phlox, Joe Pye Weed, Clover, Bee Balm, Sunflower
Common Sulphur	White Clover, Vetch, Alfalfa, White Sweet Clover	Clovers, Goldenrod, Aster, Milkweed, Phlox, Knapweed
Monarch	Milkweeds	Milkweed, Goldenrod, Joe Pye Weed, Thistle, Cosmos, Gayfeather, Lilac, Lantana
Pearly Crescentspot	Various Asters	Aster, Thistle, Black-Eyed Susan, Fleabane, Milkweed
American Painted Lady	Everlastings, Pussy Toes, Burdock, Ironweed	Thistle, Knapweed, Aster, Yarrows, Goldenrod, Red Clover, Marigold, Zinnia, Milkweed, Heliotrope
Great-Spangled Fritillary	Violets	Thistle, Joe Pye Weed, Black-Eyed Susan, Milkweed, Coneflowers, Bergamot, Ironweed, Mint
Mourning Cloak	Willow, Elm, Poplar, Birch, Hackberry	Rotting Fruit, Sap, Shasta Daisy, Milkweed
Question Mark	Nettles, Hackberry, Elm	Rotting Fruit, Sap, Aster, Milkweed
Red Admiral	Nettles	Rotting Fruit, Sap, Aster, Thistle, Dandelion, Red Clover, Goldenrod, Shasta Daisy, Gayfeather, Dahlia, Ageratum, Stonecrop, Mint
Viceroy	Willow, Poplar, Plum, Apple, Cherry	Rotting Fruit, Sap, Thistle, Joe Pye Weed, Aster, Goldenrod, Milkweed
Spring Azure	Dogwood, Viburnum, Cherry, Sumac, Black Snakeroot	Milkweed, Dandelion, Violet, Forget-Me-Not
Checkered Skipper	Mallow, Hollyhock, Hibiscus	Aster, Knapweed, Fleabane, Red Clover

Adapted From: Tekulsky, M. 1985. *The Butterfly Garden.* Harvard Common Press. Harvard, Mass.
Prepared by: Rex Bastian, Iowa State University Extension Service

Canoeing Pena-kum-Sebo

by Jerry Spykerman

PENA-KUM-SEBO (PENA — *TURKEY,* SEBO — *WATER*) WAS THE INDIAN NAME FOR THE TURKEY RIVER. At the time the white man came upon the river in 1834, wild turkeys were so numerous they were often shot from the cabin doors. But as the country became more populated, the wild turkey disappeared. Today, however, with the successful restoration efforts of recent years, turkeys are plentiful and the river can once again live up to its name.

KEN FORMANEK

Turkeys, once again, inhabit stretches of the scenic Turkey River. This float trip begins at Clermont, but before paddling downstream make a visit to historical Montauk, mansion of former Governor William Larabee.

The Turkey, the largest river in northeast Iowa, begins in Howard County and flows in a southeasterly direction through Winneshiek, Fayette and Clayton Counties. It is about 120 miles long and the drainage area at the confluence with the Mississippi River is 1,684 square miles. In the upper reaches of the river it flows through a flat glacial-deposited region. From the Fort Atkinson area (Winneshiek County) to Elkport (Clayton County) the river flows through limestone bluffs. From Elkport to the Mississippi the valley widens out and flows through silt and sand.

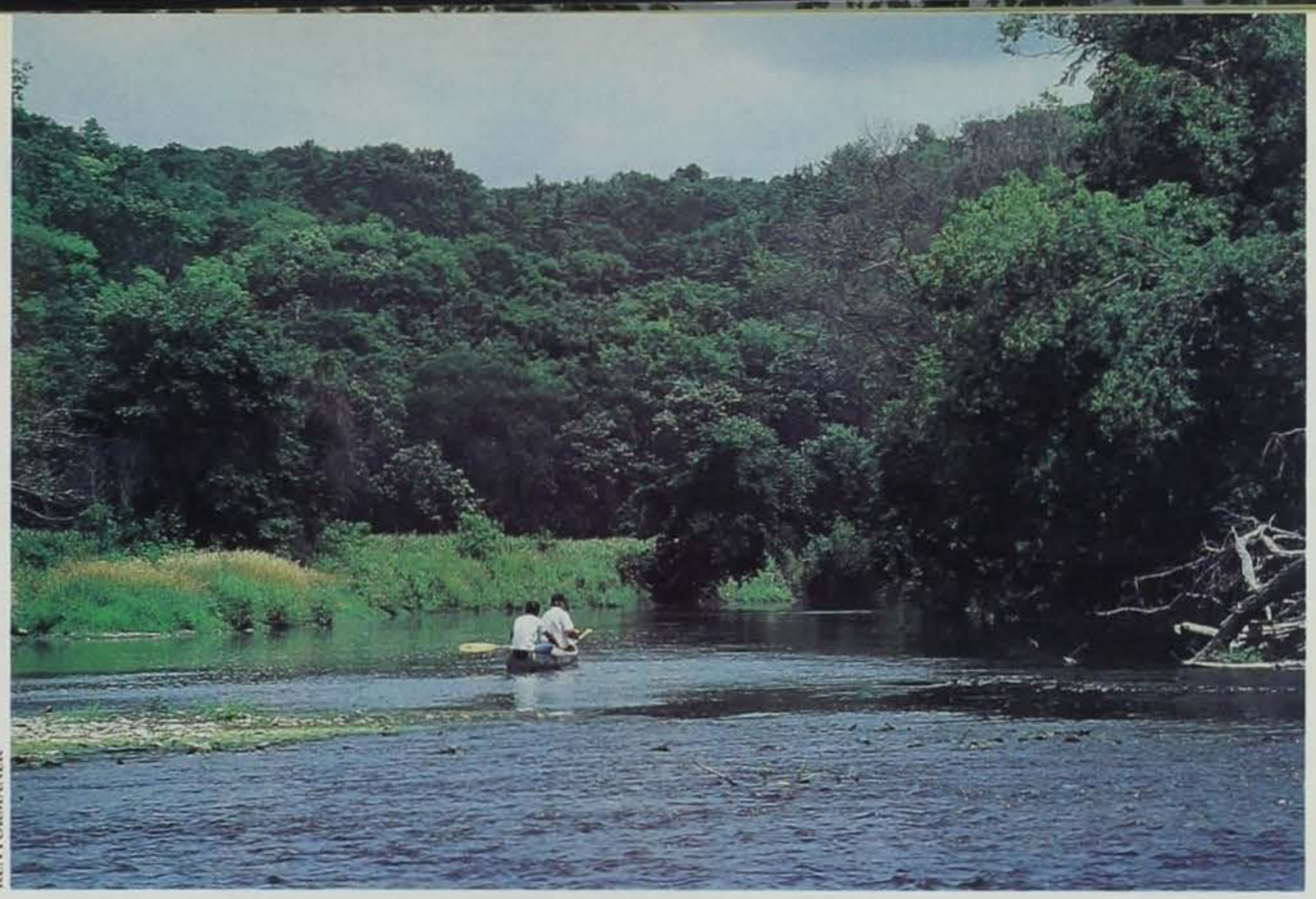
The river from Clermont to Garber has some historical landmarks and beautiful scenery to enjoy while canoeing. The river valley is narrow and bounded by bluffs covered with hardwood timbers and cedars. In this area, the rock-lined river's strong current seldom falls less than four feet per mile but there are no dangerous rapids to contend with and the only major obstruction in this stretch of the river is a concrete dam in Elkader.

Before beginning the journey down the Pena-kum-Sebo at Clermont visit Montauk, the mansion of former Iowa Governor William Larrabee. It is a treasure of accumulated history.

From Clermont to Elgin it is approximately 3.6 river miles. (Throughout this article the distance will be given in river miles. Traveling times between places will not be considered because river conditions vary as well as the canoeist's ability.) The first two miles downstream the river valley is quite narrow with limestone bluffs and large rocks in the river. This area has some good smallmouth bass fishing and is fun to float through. At Elgin there is a three-acre park managed by the Fayette County Conservation Board. This park contains a canoe launching area, picnic shelters and rest rooms. By late summer a camping area will be constructed.

RON JOHNSON

The distance from Elgin to the Big Spring trout hatchery is 11.3 miles. The hatchery is a good place to stretch your legs and tour the facility. Maybe you will spend the night at the small primitive campground adjacent to the hatchery. Big Spring is Iowa's largest spring with flows ranging from 15,000 to 25,000 gallons per minute. It was purchased in 1961 and is an integral part of the put-and-take trout program. Annually 225,000 rainbow and 40,000 brown trout are reared in 24 raceways and four ponds. Nineteen streams in Clayton, Fayette and Allamakee Counties are



KEN FORMANEK

stocked from April through October out of this facility.

The distance from Big Spring to Elkader is approximately seven river miles. As you approach Elkader you will see a large bluff on your left named Lovers Leap. Story has it that a white settler, mining for lead, fell in love with an Indian chief's daughter. Both were caught stealing the precious lead and knocked unconscious. When the daughter awoke, she presumed her lover dead and threw herself off the cliff. The settler, after seeing her limp body, did the same.

About 150 yards above the dam, on the right, the trip's only portage is necessary. It's a good one, though. The portage is through town and is just less than a mile. Put back in at Riverside Park located below the second dam. Pause a minute to catch your breath and look back upstream and admire a stone arch bridge built in the 1880s. When it was built, it was the longest bridge of its kind west of the Mississippi. The bridge has two spans and is 346 feet long. It required nine months to complete.

From Elkader to Motor Mill is about 5.2 river miles. Here, the current in the Turkey becomes fairly fast with occasional small rapids. At the intersection of Highways 13 and 56 there is a two-acre park managed by the Clayton County Conservation Board. The park has a canoe landing area, picnic and toilet facilities, and water available.

On your left looms the picturesque stone building — Motor Mill. This six-story building was constructed in the late 1860s. A cooperage, inn, ice house and livery stable were also built to accommodate people patronizing the mill. Stone for the buildings was quarried from the cliff and lowered by cable car. Three of the sides have rounded stone and the other side has square stone. Four stone masons did the work and each was reportedly responsible for one side. Motor Mill, managed by the Clayton County Conservation Board, entered the National Register of Historic Places in 1977.

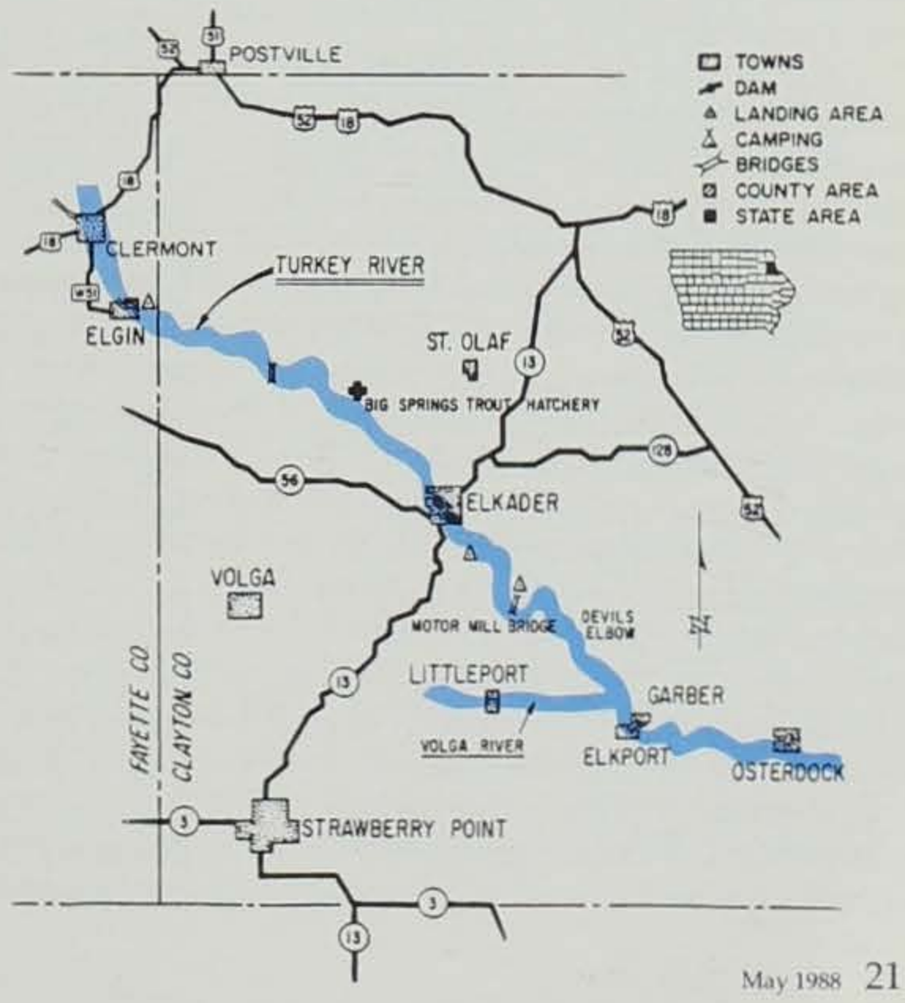
The distance between Motor Mill and Elkport/Garber where the trip will end is about 9.8 miles. The current below the mill is swift and flows through steep, wooded bluffs. As the river meanders through the bluffs it makes many sharp bends. One of these bends is known as Devil's Elbow. It is on the right side and can be identified by two large pine trees high on the bluff. Just below this point are long shallow rapids that may have to be waded during low water.

Just above Garber the Volga River flows into the Turkey. In the summer of 1839 a fatal duel took place here. It seems that the wife of a Winnebago chieftain drowned in the river. The chief went to a Menominee encampment at Clermont to obtain a Winnebago woman from the medicine man. He returned to the mouth of the Volga with his new bride.

A few days later a small band of Menominees arrived. It seems that the brother of one brave had given many presents to the medicine man for the young woman. To settle this dispute a duel to the death took place between the Winnebago chief and the two Menominee brothers. The duel took place within a triangle made with a rawhide thong drawn around three stakes. All three Indians died during the duel and were buried there.

This summer plan a canoe trip down the Pena-kum-Sebo. Enjoy the sites and beauty of the land along the Turkey River. On your trip you might see one of the wild turkeys that are abundant once more in the wooded bluffs of northeast Iowa.

Jerry Spykerman is a fisheries biologist located at Big Spring trout hatchery.



GEODES:

A Look At Iowa's State Rock

by Brian J. Witzke

TIM KEMMIS

Iowa geodes have long been objects of curiosity, their sparkling interiors containing some of the most beautiful crystals to be found anywhere in the Midwest. Although geodes are known from many localities around the world, one of the most productive and famous collecting regions is encompassed within a 35-mile radius of Keokuk, Iowa. Rock collectors commonly refer to geodes from this region as "Keokuk geodes." In keeping with the world-renowned status of the Iowa geodes, the Iowa General Assembly declared the geode as the official "state rock" in 1967.

The word "geode" is derived from the Latin meaning "earthlike," a reference to their rounded shape. Most Iowa geodes are roughly spherical, often lumpy or cauliflower-like in external form, with diameters typically ranging between about two and six inches. However, specimens up to 30 inches are known. The most-prized geodes have hollow interiors, although many geodes are solid objects in which crystal growth has filled most or all of the interior volume. Although the distinction may seem subtle, it is important to contrast geodes with other crystal-lined cavities, or "vugs." Geodes differ from vugs in possessing an outer mineral layer which is more resistant to weathering than the host rock. As such, complete geodes commonly weather out of rock exposures and accumulate in stream bottoms. Crystal-lined vugs would not weather in such a manner.

Geodes from the Keokuk area contain a variety of minerals, but quartz is dominant in most. Quartz is silicon dioxide, the primary mineral in ordinary sand. Beautiful transparent to white quartz crystals cover the walls of many geode cavities. These crystals become larger and fewer in number towards the center of the geode, and terminate in characteristic pointed hexagonal pyramid shapes. Micro-crystalline quartz, or chalcedony, whose component crystals are too small to be seen with the naked eye, forms the outer shell in all "Keokuk geodes." Chalcedony layers also encrust the interior walls of many geode cavities, covering the surfaces of the earlier-generation quartz crystals in a variety of colors, including white, gray, blue, yellow and orange. Calcite is a common and attractive calcium carbonate mineral in many geodes, which occurs in a variety of crystal habits and colors. An additional 17 minerals have been identified in "Keokuk geodes." Some of the more noteworthy include: kaolinite, a white clay mineral; dolomite in saddle-shaped crystals; pyrite or fool's gold, an iron sulfide; and sphalerite, a blackish zinc sulfide.

Iowa's renowned "Keokuk geodes" can be found in specific stream drainages and excavations in parts of southeastern Iowa (especially Lee, Henry and Van Buren Counties), including the area near Geode State Park. Most geodes are derived from strata of the lower Warsaw Formation, a widespread rock unit of Mississippian age. Muds deposited in a shallow sea about 340 million years ago were primarily calcium carbonate and clay, and were subsequently lithified to form the shales, shaley dolomites and limestones that we see today. Fresh geodes can be dug out of exposures of the lower Warsaw Formation, where they are concentrated in certain layers. Where water and streamflow have eroded these strata, concentrations of geodes may accumulate in stream channels. Although the bulk of Iowa's geodes are derived from the Warsaw Formation, geodes also are known from other formations of Devonian and Mississippian age at scattered localities in eastern and central Iowa.

The origin of geodes has vexed geologists for a considerable time, and many hypotheses have been put forward. The most recent geologic research, however, agrees on three general points: 1) geode precursors were concretions (nodules formed by outward growth around some nucleus) which grew within soft unlithified sediment; 2) the outer shells of these concretions were replaced subsequently by chalcedony; 3) the interiors of the concretions were dissolved, leaving a hollow space into which quartz crystals could grow. The composition of the original concretions is unclear, though geologists propose they were either limestone or anhydrite, a fairly soluble calcium sulfate mineral related to gypsum.

The minerals now seen inside geodes were transported in groundwater solutions and then precipitated as replacements of the geode walls or as crystalline growths within their hollow interiors. The ultimate source of the mineralizing waters remains speculative. Many common geode minerals, especially quartz, are only weakly soluble. Therefore, substantial volumes of water had to migrate through the lower Warsaw strata to precipitate the observed minerals.

Collecting geodes can be both fun and educational. Once you've located exposures of lower Warsaw strata or a geode-bearing stream course, all that's required is a little patience and a good bricklayer's or rock hammer. A sharp blow with a hammer is usually sufficient to crack open individual geodes, exposing their crystalline interiors to daylight for the first time. Remember that most geode-collecting localities are on private land, and permission must be secured before entering.

Reprint from **Iowa Geology,** *1987*

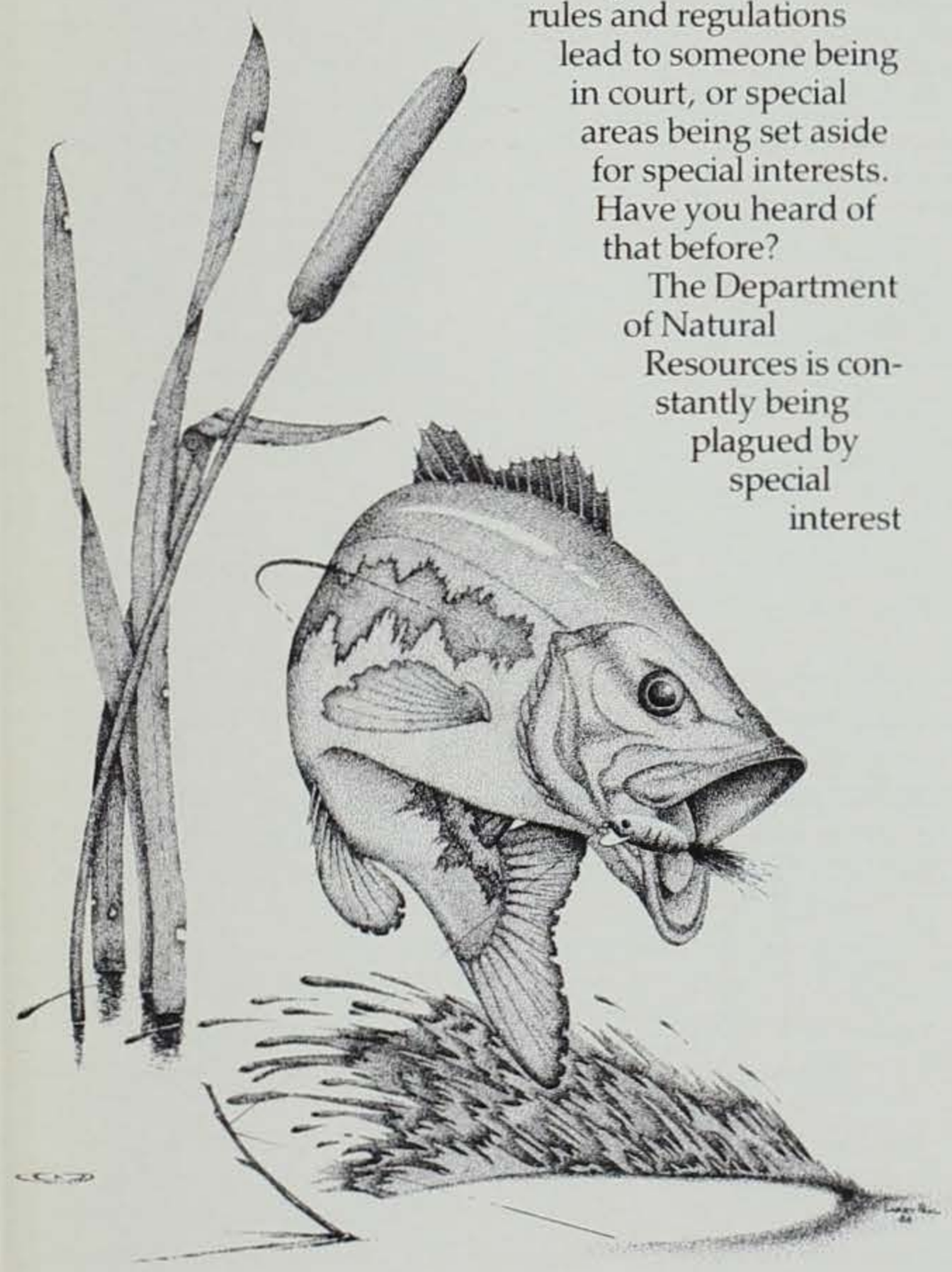
Brian J. Witzke is a geologist for the department and is located in Iowa City.

WARDEN'S DIARY by Jerry Hoilien

There are about as many kinds of anglers as there are kinds of fish, and they come in about the same varieties of sizes, shapes and ages — big and small, short and tall, young and old — such a conglomeration. It's always amazing to me to see the variety of methods that people take fish! Geographical locations also sometimes dictate the method of take which is accepted in the community. In southern Iowa, for instance, trot-lines, or throw-lines as they are sometimes referred to, has always been accepted. Juggin' is still another method that is looked favorably upon in the southern counties, but is considered distasteful in the northern areas, particularly in the cold-water trout streams.

The purist trout angler *only* uses flies with a flyrod. I like to fly-fish myself, but prefer my ultra-lite with a spinner. If you look in my tackle box, you'll find quite a variety of tackle, including (when I get real hungry) some #14 treble hooks and a little Velveeta cheese. In the winter I might even consider the lowly worm.

The problem comes when we start to dictate to someone else what *we* think is *the* way to do it. Here starts the rules and regulations and the conflict of opinions and unfortunately, sometimes these rules and regulations lead to someone being in court, or special areas being set aside for special interests. Have you heard of that before?



The Department of Natural Resources is constantly being plagued by special interest groups or individuals who want it *THEIR* way. I can still remember the individual who came in one day and was seriously promoting a special deer season for *spears*. He was even to the point where only "flint-type" heads were permitted. I looked at him and could imagine him in a tree overlooking a deer trail, perched, ready to drop down upon an unsuspecting buck. Might have been interesting! He was dead serious. Maybe the blaze-orange requirement could have been substituted for a loin-clothe...

Back to anglers. It doesn't take much to keep them happy. They'll sit by the hour and relax. Most anglers don't make much noise. Sometimes, the bass anglers in a contest forget about others and roar about with their bass-boats, much to the disgust of the bluegill angler who wants to sit quietly in the backwater and objects to being bounced around by their wake. I guess it's all in "who's ox is being gored." RIGHT?

I have to tell you about the time I was up at Lock and Dam #9 near Harpers Ferry. I had covered up my shoulder patch and badge (ol' game warden trick) and was trying to look like a regular angler as I approached the 300' limit in front of the rollers. There were several boats anchored right on the line and casting towards the dam. However, there was one boat anchored right in front of the rollers, a very dangerous place to be. Three young men, all standing up in the boat (to make matters worse), and none of them wearing any life jackets, but catching strippers like mad! The other boaters were anchored legally, but try as they would, they couldn't cast far enough to reach the area the strippers were boiling. I finally glanced over to the boat near me, the angler there had grown tired of trying, had laid his rod down and with his elbow on his gunnel and chin in his hand, he was staring at me. He knew who I was and was patiently waiting for me to do something.

I had to smile as I started my motor. Just can't fool 'em all. The bottom of their boat was full of strippers as I escorted them away from the dam and into the quiet water. Not a life-preserver in the boat, no fire extinguisher, no registration, no nothing. Not a fishing license among them! What a crew! They all got tickets.

This would have made a good story, but there's more. One never paid his fine. I notified the Wisconsin game warden who made every effort to locate him. Seems he had given me a false name.

Almost a year went by, and I got a call from the Wisconsin warden. "Do you suppose you would recognize that guy?" he inquired.

When he marched out in jailhouse fatigues, there wasn't much of a smile on the guy's face. "Why'd you lie to me over a small fine?" I asked. Seems there was a warrant out for him, and that's what he was doing in jail now. I signed an additional charge on him. In Wisconsin, it's a violation to give false information to a warden. The court took a dim view of his antics and accessed the maximum fine plus some jail time for his other warrants. Like I said earlier, TAKES ALL KINDS!

CONSERVATION UPDATE

MISSISSIPPI RIVER BASS - WIRED TO TELL SECRETS

by Bernard Schonhoff, fisheries biologist

Where are the fish? This is a question often asked of a fisheries biologist. For the last several years, Department of Natural Resources' biologists on the Mississippi River have been trying to answer this question with the help of radio tracking equipment.

Radio transmitters, about half the size of a Bic lighter, with a six-inch wire antenna, are surgically implanted into largemouth bass. These radios allow the biologist to locate the bass at anytime. Biologist are hoping these "wired" bass will tell what habitat is important for spawning, what areas bass use in the summer and winter months, and what amount of water level fluctuation will cause a bass to abandon a nest.

In order to begin answering these questions, the bass are first captured using electrofishing methods. Likely candidates for transmitters are weighed and measured to ensure they are large enough to accommodate the weight of the transmitter.

Each bass chosen is immobilized in an anesthetic solution. Once the anesthetic has taken effect the bass is placed in a holding frame with a constant water bath. An incision, about an inch long, is made on the ventral surface of the fish near the pelvic fins. The radio transmitter is checked to insure it is functioning properly, sterilized to prevent infection and inserted into the fish. The incision is sutured shut and the fish is given an injection of an antibiotic. An external, orange tag is then placed on the fish near the dorsal fin. After the implanting procedure, the bass is placed in an anti-fungal bath until it is completely recovered and then released near the point of capture. Once the bass is back in the water, the task of locating the fish begins so that data on its habitat choice can be collected.

Location of a bass is done with the use of a radio receiver tuned to the frequency of each individual transmitter. For locating fish that are a great distance away, a boat-mounted directional antenna is used. This antenna picks up the strongest signal when pointed in the direction of the transmitter. Once in closer proximity, a hand-held antenna can be substituted for the larger antenna until the position of the bass has been determined.

After the exact position of the bass has been determined, information at the site can be gathered. Data of interest include water clarity, water temperature, water depth, dissolved oxygen content, proximity to structure and substrate composition. This information will ultimately help biologists in enhancing and protecting limited habitat, which will improve and protect bass populations.

Although the project is still in progress and not all of the data has been collected, biologists do have some preliminary observations that anglers will find interesting.

The project began in the late summer of 1986 with radio tagging of largemouth bass. Only one bass showed any significant movement from the release site during the late summer period. All the implanted bass chose shallow water and were always associated with some type of structure such as stumps, fallen trees or aquatic plants.

During the fall period, movement increased and the depth preference of the fish increased slightly. During this time a total of 15 bass were tracked. All 15 bass remained near structure during the entire period.

The winter signaled a gradual movement of all the bass into the flooded timber surrounding the study area. This movement was in response to a gradual rise in the river that inundated the timber. The bass used the flooded timber as a means of

avoiding the faster and stronger current in the open water areas.

Spring is a time of added stress for bass. Not only are water levels normally elevated, but the spawning season also occurs during this time. During this period, the bass demonstrated the most movement — going from deep to shallow water and back, and from flooded timber to open water and back.

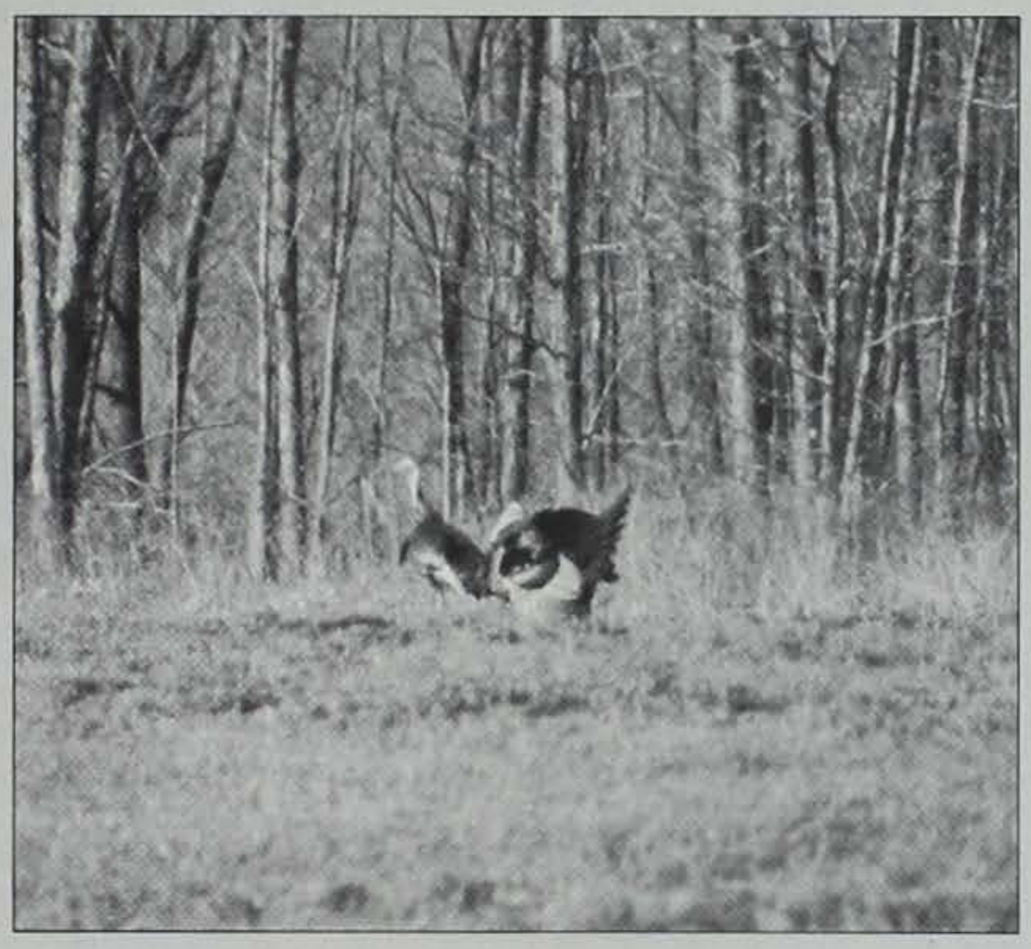
During all periods of the study, the depth at which the fish were located was related to the transparency of the water. As the water clarity increased, so did the depth at which the bass were located.

As the study continues, biologists hope to learn why bass choose the locations they do to meet their life requirements. With the secrets these "wired" bass tell, biologists may be better prepared to answer the question, *"Where are the fish?"*

REMINDER OF CHANGES IN STATE PARK USER PERMITS

Officials of the Department of Natural Resources remind park visitors that the annual state park user permit is $5.50 and the daily permit is $2.00. The daily permit is valid until 10:30 p.m. on the day following purchase.

A second annual permit may be purchased for a vehicle registered in the same household (same address) for $2.00. Free permits are no longer available.



120 ACRES OF WILD TURKEY HABITAT DONATED TO THE DNR

The Iowa Chapter of the National Wild Turkey Federation recently purchased 120 acres of prime wild turkey habitat in Guthrie County, Iowa, and subsequently donated the property to the Department of Natural Resources.

The majority of the site is comprised of a mature oak-hickory forest, of which very little remains in west-central Iowa due to intensive agricultural practices engaged in over the past several decades. Eleven drainageways dissect the upland portion of the site and then terminate in a wet bog-type valley which runs through the area. The valley has numerous seeps and springs along with native prairie grasses. Studies show that several endangered plant and mammal species may reside at the site. In addition, the property contains a significant population of eastern wild turkeys and white-tailed deer.

Iowa chapter president, Glenn Vondra, negotiated the purchase agreement with the Audubon State Bank, the previous owner of the timber. The bank is owned by the Garst family, who are noted for their efforts in soil and wildlife conservation.

WINTER TURKEY TRAP AND RELEASE PROGRAM CONCLUDES

The Iowa Department of Natural Resources has concluded its 1987-88 winter turkey trap and release program, with 725 wild turkeys being live-trapped. Of this figure, 266 turkeys were relocated to other areas of Iowa and the remaining 459 turkeys were shipped to other states, which are attempting their own turkey restoration programs.

The out-of-state shipments are often part of a cooperative wildlife "swap" agreement. Many of this year's birds were sent to Texas, which provides funding through the National Wild Turkey Federation (NWTF) to the Iowa DNR. The DNR will use this money to purchase Iowa woodlands to further enhance turkey habitat in Iowa. In previous years, Iowa has sent turkeys to Kentucky, which provided funding to Louisiana. Louisiana, in turn, shipped river otters to Iowa. Iowa turkeys have been traded for prairie chickens from Michigan and for ruffed grouse from Indiana.

The wild turkey was extinct in Iowa in the early 1900s. The state began reintroducing turkeys in the mid 1960s By the mid 1970s, the population had grown to the point that Iowa turkeys were being trapped and shipped elsewhere. The turkey has been reestablished to the point that hunters now enjoy both fall and spring hunting seasons.

The DNR will resume live trapping and releasing next winter. Anyone with suggestions for areas that would support turkeys should write the DNR, Wallace State Office Building, Des Moines, Iowa 50319-0034 or (515)281-8660.

MOREL-FALSE MOREL SURVEY

The statewide morel-false morel survey is being conducted for its fifth year. Researchers Lois Tiffany, Don Huffman and George Knaphus will again identify specimens and preserve them for future study. There have been excellent contributions from many counties in the preceding four surveys but there are no reports for either morels or false morels from the following counties: Adair, Adams, Audubon, Buchanan, Buena Vista, Calhoun, Carroll, Cass, Cerro Gordo, Cherokee, Chickasaw, Clay, Crawford, Franklin, Grundy, Howard, Ida, Lyon, O'Brien, Osceola, Pocahontas, Taylor, Worth

Most other county reports do not include all of the species possibly present. Only one specimen of a species is needed and older or imperfect specimens are satisfactory (keep the best ones for yourself). The April 1986 issue of the *Iowa CONSERVATIONIST* has an illustrated guide to the morels and false morels.

This survey is now recognized nationally as an important research study. No other state has conducted a survey of this breadth and depth. The most important factor is the time and effort of the people who find the fungi and send them to be identified, recorded and studied.

Specimens can be taken to extension offices for mailing or mailed directly to either:

Dr. Lois Tiffany
Plant Pathology Extension
Iowa State University
Ames, Iowa 50011
or
Dr. Donald Huffman
Biology Department
Central College
Pella, Iowa 50219

ICEC: THE FIRST 30 YEARS

In 1953, the national Conservation Education Association was organized to implement policies in conservation education established by the Izaak Walton League. Shortly thereafter, a loose consortium of representatives of educational institutions and organizations was formed in Iowa. Its goals were to participate in conservation education programs on a national and regional level and to begin the development of an effective, statewide conservation education program.

This loose consortium, the Iowa Conservation Education Council (ICEC), was incorporated in May 1958. ICEC's stated purposes were to stimulate a closer cooperation among agencies and institutions interested in conservation; to assist schools and other groups in conservation education; to stimulate preparation of conservation education materials; and to stimulate the development of conservation education in Iowa.

In the early years, ICEC consisted of representatives of more than 40 institutions and organizations interested in conservation education. Individuals such as Frank Schaller, Frank H. Mendell, Min Amemiya and Ben Claussen are mentioned frequently in old minutes and other documents.

Among other accomplishments, this group wrote the first *Conservation Sourcebook*, a background information text for Iowa teachers, participated in one of the first Midwest conservation education conferences; sponsored teachers' workshops and field trip guide books; assisted in the lobbying effort for the Conservation Education Center at Springbrook State Park; and assisted in the sponsorship of the Iowa Teacher's Conservation Camp.

In 1968, ICEC was reincorporated and its bylaws changed to allow for a general, voting membership. The first edition of the newsletter was published in 1969.

Through the 1970s and into the 1980s, ICEC continued to grow. Ben Claussen and Min Amemiya continued their work, along with Mary Duritsa, Margaret Kuchenreuter, Bill Edgar, Duane Toomsen, Lynn Betts, Don Menken and Bob Rye, as well as many others.

In 1982, ICEC was again reincorporated. The purpose this time was to provide an equal opportunity for all members to run for and participate on the executive committee, regardless of their affiliation, and to allow members, as an organization, to comment on legislation concerning conservation and environmental education. ICEC's stated objectives remained the same.

With more than 700 members, ICEC is today one of the largest and most effective state conservation education organizations in the nation. ICEC has published activity booklets on forests, soils, prairies and fears; produced a clip art portfolio; sponsored Doug Wood's *Islands* album of conservation music; sponsored at least six workshops and conferences per year, including several regional and national conferences; and provided grants to the Iowa Association of Naturalists.

FREE FISHING DAYS, JUNE 11 AND 12, 1988

For the second consecutive year, sport fishing license requirements have been waived for residents of Iowa on Saturday and Sunday, June 11 and 12, 1988. This two-day period of free fishing has been set aside by the Department of Natural Resources in recognition of both National and State Fishing Week, June 6-12, 1988.

All laws regarding size limits, bag limits, etc., must be followed. Beginning anglers should familiarize themselves with the laws pertaining to sport fishing by obtaining a copy of the Iowa 1988 fishing regulations brochure available from all fishing license outlets such as county recorders, sporting goods stores and DNR offices.

CONSERVATION ACHIEVEMENT AWARDS

Each year the Iowa Wildlife Federation (IWF) honors individuals and organizations involved in conservation. The awards are available to anyone involved in the natural resources area.

The IWF awards are given in 12 separate categories: Governor's Award, Conservation Organization, Legislative Conservationist, Hunter Safety Education, Forest Conservationist, Conservation Communicator, Youth Conservationist, Soil Conservationist, Air Conservationist, Water Conservationist, Wildlife Conservationist and Conservation Educator.

For more information and to make a nomination, contact Joe Wilkinson, Iowa Department of Natural Resources, 123 N. Capitol Street, Iowa City, Iowa 52242, (319)335-1570. Include the name and address of the nominee as well as the category for nomination. Documentation of actual accomplishments is required. The deadline for nominations is June 6, 1988.

Most butterflies have short memories. According to International Wildlife magazine, a scientist at the University of Colorado found that butterflies feed repeatedly from the same flower species because it takes too long to learn their way around new ones. If they venture to a new flower, then return to the old one, they must relearn the path to the nectar.

RYE HONORED BY IOWA ASSOCIATION OF NATURALISTS

Robert P. Rye was recently presented with the first honorary membership in the Iowa Association of Naturalists. Rye, the manager of the Conservation Education Center at Springbrook, was recognized for his continued efforts in drawing attention to the importance of natural resource interpretation and for his support of naturalists. Additionally, Rye was acknowledged for his involvement with the association—assisting in funding projects, developing resource guides, hosting ranger/naturalist workshops and other support projects.

DONATIONS

Edgewood Locker Edgewood	Processing of a deer valued at $106 for DNR special event
Telephone Pioneers of America Council Bluffs	Removal, packing and shipping of 1,700 telephone "selector" covers for use as birdhouses for birdhouse installation, statewide
Adamson Contracting Co. Batavia	Use of heavy equipment valued at $315 for radio control model airplane field construction at Lake Manawa State Park
Mike Woods Red Oak	Car rims and washing machine tubs valued at $66 for grill construction at Viking Lake State Park
McCoy Repair Service Red Oak	Car rims valued at $60 for grill construction at Viking Lake State Park
LeRette TV & Appliance Red Oak	Washing machine tubs valued at $60 for grill construction at Viking Lake State Park

CLASSROOM CORNER

by Robert P. Rye

Project WILD is a set of materials for kindergarten through 12th grade which is used by educators to study wildlife. Wildlife includes all animals that are not usually domesticated. Examples are insects, spiders, birds, worms and yes, even bats.

For this exercise on bats, I will give you the number of letters in the answer. Example: This bat is on the endangered species list (7). **Answer:** Indiana.

1. Type of animals that have fur and give milk (7).
2. Place where many bats hibernate (4).
3. A description meaning an animal could become extinct (10).
4. A word describing the bat activity of being dormant in winter (9).
5. Describes a bat that feeds on other animals (8).
6. A name for bat droppings (5).
7. Some bats eat as many as 3,000 of these per night (7).
8. Bats are able to travel using this system of navigation (5).
9. Some bats get this from flowers (6).
10. Bats waste this when they are awakened during their winter sleep (6).

Answers:

1. mammals 2. cave 3. endangered 4. hibernate 5. predator 6. guano 7. insects 8. sonar 9. nectar 10. energy

Little River Recreation Area

SOUTHERN IOWA'S NEWEST TREASURE

Story by Richard Erke
Photos by Ron Johnson

The Little River Recreation Area really started back in 1962 when a handful of concerned citizens, community leaders and conservation agencies met to decide where to locate a reservoir to provide the city of Leon with a steady supply of water for the future. After years of planning, the decision was made to locate the reservoir west of Leon in the Little River watershed.

The lake would not only be a source of water, but it would also provide fish and wildlife habitat, public recreation and, most importantly, flood control as part of the Little River Watershed Project.

Although it took the efforts of many, the main sponsors of the lake included the U.S. Soil Conservation Service (SCS), the Decatur County Board of Supervisors and Conservation Board, the Iowa Conservation Commission (now the Iowa Department of Natural Resources (DNR)), the cities of Leon and Decatur City and the Southern Rural Water Association.

In 1985, 23 years after that first meeting, Little River Lake was dedicated. The total cost of the project was $3,047,807, with the SCS paying 75 percent and the local and state sponsors paying the remaining 25 percent of the project's costs.

Little River Lake is located one-half mile west of Leon in south-central Iowa. It has a surface area of 787 acres and is surrounded by 1,356 acres of public land. The land and lake are collectively called the Little River Recreation Area. This area is managed jointly by the Decatur County Conservation Board and the DNR.

Through a 25-year management agreement with the Decatur County Board of Supervisors, who holds the title to the land, the DNR maintains the lake and 1,000 acres of surrounding land as a wildlife area open to public hunting. A mixture of old pasture, cropland and brushy timber provides excellent pheasant and quail hunting, while the lake keeps waterfowl hunters busy.

The remaining 356 acres are managed by the county conservation board for a variety of uses. Much of the conservation board's management area is open to hunting, excluding a small portion around the dam and recreational facilities. This area is maintained as a wildlife refuge.

In 1985, a Land and Water Conservation Fund (LAWCON) grant of $30,228 was received by the conservation board for construction of recreational facilities at Little River. LAWCON is a federal program which helps fund the acquisition and development of recreational facilities. In Iowa, the Department of Natural Resources administers the LAWCON program.

Grant money was used to build a large picnic shelter, rest rooms, a playground, picnic facilities, a hiking trail and electric and water systems. The conservation board has also built a beach and concession building. Boat rental and bait sales will be offered at the concession, scheduled to open in the spring of 1988. Camp-

ing is not allowed at Little River Recreation Area at this time, but the conservation board plans to continue to develop the facilities, hoping someday to provide camping.

During the next few years, Little River Lake should prove to be one of the better fishing lakes in Iowa. Standing timber and brush were left to flood the upper two-thirds of the lake, creating some super fish habitat. Also prior to water impoundment, a number of "fish enhancement" structures were constructed. These structures, along with three boat ramps and six fishing jetties, were constructed by the DNR and SCS through a 50/50 cost-share agreement.

Prior to stocking fish in the lake, the upstream watershed was poisoned with rotenone to eliminate undesirable fish species. Stocking of channel catfish, bluegills and fathead minnows began in the fall of 1984. During 1985, largemouth bass, walleyes, tiger muskies and more channel catfish were stocked. Black crappies were stocked in 1986, along with additional stockings of the previously mentioned fish species.

Fish growth rates at Little River have been outstanding, and even though stocking began just a few years ago, some nice-sized fish of all species have been caught. It's not uncommon to catch your limit of nine-inch bluegill or latch onto a 17-inch walleye.

Maps of the lake showing contours, boat ramps, jetties and fish structures, as well as information about Little River Recreation Area and its facilities are available from the Decatur County Conservation Board and the DNR.

Whether you fish, hunt, hike, picnic, or just enjoy getting outdoors, Little River Recreation Area just might be the place you have been looking to explore.

Richard Erke is the director of the Decatur County Conservation Board.

CALENDAR

MAY 7 AND 8

Chichaqua Free Skinners Rendezvous. Crafts, displays, competitions, canoe rentals and nature trails at Chichaqua Wildlife Area, five miles east of Elkhart. For more information, contact Mark Thompson at (515)967-2596 or write Polk County Conservation Board, Jester Park, Granger, Iowa 50109.

MAY 29 AND 30

Pioneer Days. Pioneer Village in Scott County Park is the location for quilting, weaving, blacksmithing, cooking, woodworking and more. For more information, contact Dan Nagle, Scott County Conservation Board, Box 213, Long Grove, Iowa 52758, (319)381-1114.

JUNE 10-12

Lewis and Clark Festival. Lewis and Clark State Park is the location for early 1800s trades, foods, crafts, history and games. Also, the christening of the keelboat, "Discovery." Park user fee not required. For more information, contact Ron Williams, Lewis and Clark State Park, Onawa, Iowa 51040, (712)423-2829.

JUNE 12-18

State Park Week. Special events, including interpretive activities, fishing contests, movies and drawings for prizes at individual state parks. Also, pay for six nights of camping and receive the seventh night free. Register at any state park to win 30 days free camping (20 names will be drawn). For more information, contact individual state parks.

JUNE 19

Great Annual Springbrook Bike Ride. A 40-mile bike ride beginning and ending at Springbrook State Park, Guthrie County. For more information, contact David Hebrank, Springbrook State Park, Route 1, Box 142, Guthrie Center, Iowa 50115, (515)747-3591.

JIM SCHEFFLER

DISCOVERING THE PAST

Lewis and Clark State Park

Reprint from **We Proceeded On, August 1987**

The challenge of building a full-scale replica of the 55-foot keelboat used by the Lewis and Clark Expedition has been undertaken by the Friends of Discovery, a group organized in Onawa, Iowa, along with officials at the Lewis and Clark State Park. The park, which is located at the site of Lewis and Clark's August 9, 1804, camp, was granted National Historic Trail Site status in June 1986 by the National Park Service.

The replica is being fashioned after a 1/12 scale model done by Butch Bouvier of Council Bluffs and from drawings and descriptions found in the writings of Lewis and Clark, as well as from information found gathered from the Smithsonian Institution and a book by Leland Baldwin entitled *The Keelboat Age on Western Waters*.

According to park ranger Ron Williams, businesses and organizations in the Onawa area, the local Chamber of Commerce, the Onawa Public Library, the Mayor's Office, the Kiwanis Club and many others have been assisting and supporting the construction project.

Keelboat Replica Nears Completion

The volunteers began work on the keelboat in October 1985, and have continued construction on the first and third Saturdays of each month and on specially scheduled days when needed. The project is being funded by private donations.

The Iowa Department of Natural Resources is supplying native oak from their state forests for the project. The boat is being constructed with 4x4 ribs spaced four feet apart. In May 1986, the bow section and all of the ribs were erected upside down. The keel was then built along the entire length of the bottom in such a way as to tie all the ribs together. Next the outside was planked with 6"-wide oak. The planking was completed in early March 1987.

During the winter of 1986-87, a truck tarp covering was constructed over the worksite to allow volunteers some protection while planking the hull.

All joints were then caulked with brown oakum, an oil impregnated jute roping that has been used for centuries in caulking boats. The joints on the bottom of the boat and

up the sides at least as far as the water line were also packed with white lead paste. This area was then coated entirely with white lead.

Although early-day boats used a lot of "treenails" or wooden pegs, the Iowa group has opted to use modern galvanized ringshank nails, carriage and machine bolts and metal reinforcing plates where necessary. Since the boat will be sitting in dry dock most of the year, it was felt that wooden pegs would dry out enough to weaken the structure.

On May 9, 1987, three local utility boom trucks set up on both sides of the boats and carefully lifted and turned over the craft and set it in chocks. The local Department of Transportation authorities brought their portable scales and weighed the craft at six tons. After adding ballast, the weight was up to seven tons.

By May 30, the 9x55-foot hull was launched. It floated beautifully and proved very stable. It drafted about eight inches deep next to the keel, and about three inches deep at the chime. It is expected that as the wood soaks up water and the lower decks, lockers, cabins, and mast are added the weight of the craft will be increased to about 10 tons and will draft about eight inches at the chime.

On the weekend of June 5-7, during the third Onawa Lewis and Clark Festival, walkways were installed on the inside along the sides, setting poles were cut and applied by volunteers and the boat made its first excursion along the shore of Blue Lake. The men pushing the poles and cordelling from shore soon found that the work of moving the boat was every bit as hard as they had imagined it would be. The keelboat activity proved to be a highlight of the festival and will continue to be a highlight at Lewis and Clark Park the second weekend of June every year.

There still is a good deal of work to do before the keelboat is completed. The rear cabin has to be added, as well as the side wall lockers and walkways, the decks, the mast, awnings and riggings. This work is expected to be done in the next year, and the christening is to take place during the June 10-12, 1988, festival.

The ultimate goal of the Friends of Discovery is to have a living history demonstration during the annual festival to acquaint the public with the rigors of the crew of the Lewis and Clark Expedition as they struggled up the Missouri River in their keelboat in 1804. Although they won't be able to give the public rides on the boat, they do anticipate having the boat moored near the shore so that the public can at least be on board for a supervised visit and interpretive activity.

For further information or to offer support for this project, contact: Friends of Discovery, Lewis and Clark State Park, Onawa, IA 51040.

DNR PHOTO

In May 1987 the hull was launched.

The 1988 Lewis and Clark Festival at Lewis and Clark State Park near Onawa will be held the weekend of June 10-12. The Friends of Discovery anticipate having the keelboat replica completed and back in the water by then. Although the boat cannot take passengers, living history demonstrations of how the boat was used will be one of the highlights of the weekend. Additional programs of pre-steamboat era riverboating by Jack Custer of Louisville, Kentucky, films about the Lewis and Clark expedition, music festivals both Friday and Saturday evenings and a fur trade era rendezvous will make the weekend memorable and enjoyable for all. For more information, contact Lewis and Clark State Park.